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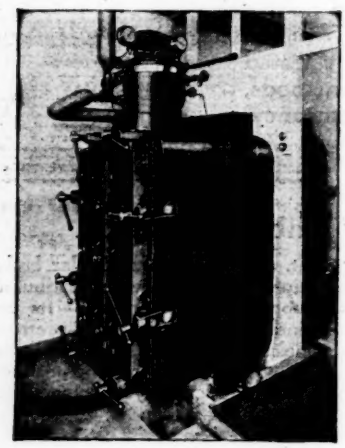

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THE WISDOM OF THE BODY:

The Harveian Oration,

DELIVERED BEFORE

THE ROYAL COLLEGE OF PHYSICIANS OF LONDON

ON ST. LUKE'S DAY, 1923,

BY

ERNEST HENRY STARLING, C.M.G., M.D.Lond.,
Sc.D.(Hon.)Cantab. and Dublin, M.D.(Hon.)Breslau,
Doct.(Hon.)Strasbourg, F.R.S.,
FOULERTON RESEARCH PROFESSOR OF THE ROYAL SOCIETY;
FELLOW OF THE COLLEGE.

"Who hath put wisdom in the inward parts? or who hath given understanding to the heart?"

Mr. President and Fellows of the College,—We are met here to-day to celebrate our annual feast, founded by the immortal Harvey with the twofold purpose of promoting mutual love and affection among ourselves and of commemorating the famous men who, by their works, have benefited the College. This is our day of All Saints, when we canonize in our memory and record our indebtedness to not only those who have assisted our work by material gifts, not only those Fellows of the College who have been teachers and leaders of successive generations in the science and art of medicine, but also all those of any race or profession on whom the mantle of Harvey has fallen and who, following his injunction to our Fellows and Members, to "study out the secrets of nature by way of experiment," have enlarged the bounds of science and increased the powers of our art.

It is customary and right in this our annual oration to begin by calling to mind the work of the Founder himself, and especially the great discovery of the circulation of the blood, which represents the beginning and the foundation of all that we know in physiology and medicine. Harvey's treatise on the Motion of the Heart is throughout so modern in spirit, so akin in conception and treatment to records of research of the present day, that we may easily fail to appreciate the stupendous advance in human physiology that it embodies, and to wonder that we have had to wait so long for the full fruition of Harvey's discovery. But it must be remembered that the ordered knowledge of the world around us, whether living or dead, which we call science, forms a connected whole, and though, as its line advances, a brilliant discovery may push one part of the line in advance of the rest, such an outpost must remain more or less in the air and incapable of further advance until the whole line has moved up to its support. We now know that many of the problems raised by Harvey, with the promise to himself and his readers of further consideration at a later date, depended for their solution on the progress of other branches of human knowledge. And that is why to-day in our minds and memories we are reckoning among our saints not only the distinguished line of Fellows of the College, but also men such as Boyle, Mayow, Hales, Cavendish, Lavoisier, Bernard, Pasteur, and a host of others, who were only in spirit our colleagues and most of whom were not even students of medicine. Indeed we might say that, during the two hundred years succeeding Harvey's work, the whole scientific world has been travailing in order that medicine might be born, and thus it is that our science has had to wait until our own days for the attainment of those ends which Harvey had in mind in his dream of the results of his discovery.

"Finally, reflecting on every part of medicine, physiology, pathology, semeiotics, therapeutics, when I see how many questions can be answered, how many doubts resolved, how much obscurity illustrated, by the truth we have declared, the light we have made to shine, I see a field of such vast extent in which I might proceed so far, and expatiate so widely, that this my tractate would not only swell out into a volume, which was beyond my purpose, but my whole life, perchance, would not suffice for its completion."

In the new light shed by his great discovery he probably failed to appreciate the extent of the dark shadows cast by the great clouds of ignorance which had still to be dispersed. But the advance of knowledge, though slow at first, has progressed with ever-accelerating speed. When I compare our present knowledge of the workings of the body, and our powers of interfering with and of controlling those workings for the benefit of humanity, with the ignorance and despairing impotence of my student days, I feel that I have had the good fortune to see the sun rise on a darkened world, and that the life of my contemporaries has coincided not with a renaissance but with a new birth of man's powers over his environment and his destinies unparalleled in the whole history of mankind.

Not but there is still much to be learned; the ocean of the unknown still stretches far and wide in front of us. But for its exploration we have the light of day to guide us; we know the directions in which we would sail, and every day, by the co-operation of all branches of science, our means of conveyance are becoming more swift and sure. Only labour is required to extend almost without limit our understanding of the human body and our control of its fate.

Harvey's Greatest Gift to the World.

The great gift which Harvey gave to us was, indeed, not his discovery of the circulation of the blood, but his method of formulating and solving a problem. For countless ages man had learned slowly and painfully by experience. The more observant among them had from time to time noticed certain recurring sequences in the infinity of fortuitous phenomena continually presented to them, and as a result mankind had by slow degrees improved his lot and his powers over the forces of Nature. But how slow was the rate of progress! There is no evidence that the age-long duration of the period during which man had sticks and stones to defend himself and to procure his food, the long delay in the discovery of the working of bronze and later of iron, are to be ascribed to any mental inferiority of those men as compared with those of the present day. What was lacking was the method. Mankind had advanced by fits and starts as the result of discoveries which were probably accidental, and these discoveries spread gradually along the lines of commerce and culture by imitation and the implicit copying of ritual. But with the realization of the possibilities of the method of experiment—that is, the creation and repetition of a chosen experience under controlled conditions, such as we find in its full development in Harvey's treatise—man came almost at a bound into the full use of the brain capacities which he had evolved during a long struggle for existence against the warring forces of an inclement nature.

It is true that the ultimate goal and the biological justification of science is the improvement of human conditions; but for the full and untrammelled exploitation of the advantages of the experimental method it is essential that mere material advance shall not be the target of our ambition. This great secret of success in science was fully realized by Harvey, when he enjoined us to search out by experiment not the causes and cure of disease, but the secrets of Nature. This implies that we are to give free scope to the spirit of curiosity, with some measure of which every man, at any rate in his youth, is endowed. We ourselves are but part of the order of Nature, and all knowledge therefore is contributory to the science of medicine.

The Work of the Heart.

Since this was the spirit that actuated Harvey, it is evident that his whole life would not have sufficed for the completion of the work opened up to him by his great discovery. Under its light he could see many summits to be attained and the beginning of paths which must be followed. But long and arduous search was necessary before these paths could be traced out in their entirety. Thus the determination of the output of blood from the heart and the cause of its variations evidently seemed to Harvey a problem whose solution was ready to hand. He says:

"The actual quantity of blood expelled at each stroke of the heart, and the circumstances under which it is either greater or less than ordinary, I leave for particular determination afterwards from

numerous observations which I have made on the subject. Meantime, this much I know, and would here proclaim to all, that the blood is transfused at one time in larger, at another in smaller quantity; and that the circuit of the blood is accomplished now more rapidly, now more slowly, according to the temperament, age, etc., of the individual, to external and internal circumstances, to naturals and non-naturals—sleep, rest, food, exercise, affections of the mind, and the like."

But many years had to elapse before we could give a quantitative expression both to the amount of blood under normal conditions and to its variations, and explain the manner in which these variations are brought about. The Rev. Stephen Hales, second only to Harvey as an experimental physiologist, has only calculations based on measurement of the dead organ. The determination of the output in the living animal was first made in our own times, and it is only within the last ten years that methods have become available which reveal in man himself the quantity of blood leaving the heart in each unit of time, and therewith enable us to estimate the total work of this organ. Such methods have been devised by Krogh and by Haldane. If we accept the results of the former, we may say that in a normal man at rest each cavity of the heart expels about 4 litres a minute. During violent exercise, when, as we know, the requirements of the body for oxygen may be increased tenfold, this quantity rises to 24 or even to over 30 litres a minute. These figures convey only imperfectly the enormous rush of blood which is being effected by the heart under these conditions. An ordinary laboratory tap will deliver nothing like 30 litres a minute; to obtain this amount it is necessary to have recourse to a large tap such as that which is supplied to a bath. It means that the whole blood must pass through the heart and round the body every ten seconds and complete the circulation of the body six times in every minute. And it must be remembered that the heart is putting out this colossal amount of blood against an arterial pressure which is higher than normal and which may amount to 150 to 180 mm. Hg, as against the 100 to 110 mm. which is the ordinary systolic pressure in the arteries of a resting individual.

We see, therefore, that the heart has a marvellous power of adapting its work and its performance in accordance with the needs of the body as a whole, and is fully deserving of the feeling of respectful admiration which inspires Harvey to speak of it as "the sun of the microcosm," "the household divinity," "the foundation of life," "the source of all action."

Its Power of Adaptation.

To search out the intimate character of this power of adaptation is a problem almost as enthralling in interest as the demonstration of the circulation itself. It is easy to show that the increased output of blood from the heart during exercise is simply an expression of an increased inflow into this organ, the heart being so constituted that under normal conditions it will send on into the arteries all the blood that flows into it from the veins. Harvey probably had some inkling of this power when, in speaking of the action of the auricles, he ascribes to them the property of exciting a stronger contraction on the part of the ventricles, comparing the latter to the tennis player who can strike more forcibly and further if he takes the ball on the rebound.

In the intact animal a large number of processes, nervous as well as chemical, are involved in the increased action of the heart during muscular exercise. By the action of the central nervous system and of other physiological processes involved, the strain thrown on the heart is minimized, so that it can effect the increased work with the greatest possible economy of effort. But the intimate character of this power of adaptation is only fully displayed when we cut away these protective mechanisms which are normally shielding the last citadel of life, and study the reaction of this organ when it is entirely isolated from the central nervous system and is reduced to the condition of a muscular pump with valves, working rhythmically and steadily in virtue of its own automatic powers.

We can make a "heart-lung preparation" in which, the lungs being retained in connexion with the heart, the blood passing through this organ is kept properly aerated. The systemic circulation is, however, replaced by a system of elastic tubes passing to a venous reservoir, in which we can vary at will the inflow of blood into the heart, the arterial pressure (and therewith the resistance to the expulsion of blood from the left ventricle), and the temperature of the blood supplying the heart, while we can measure the pressures at any moment of time in all the cavities of the heart as well as the changes in volume of this organ. In such a preparation we find that, within very wide limits, the output of blood corresponds exactly to the inflow. Whatever is supplied to the heart on the venous side is expelled by it on the arterial side. And again, within very wide limits, whatever is the resistance to be overcome in the arteries, so long as we keep the inflow of blood constant, the output of blood by the left ventricle remains unaltered whether the pressure in the aorta be 40 or 200 mm. Hg.

We know now that the energy for all vital movements is derived immediately from the food, and in each tissue from the oxidation of the constituents of the tissue or of the blood circulating through it. It is possible in such an isolated heart to measure its respiratory exchanges and therewith the extent of the oxidative processes responsible for the energy of the heart's contraction. We then find that the amount of oxygen taken in by the heart and converted for the most part into carbonic acid is proportional to the amount of work that the heart is set to do. The isolated heart is like the whole man—the harder he works the greater are his respiratory exchanges. I am accustomed to compare the heart with an ideal motor car which, without action on the part of the driver, would automatically admit more petrol and air when the resistance to the movement of the car increases—as, for instance, in going uphill.

The Law of the Heart.

The heart has thus the power of automatically increasing the chemical changes and the energy evolved at each contraction in proportion to the mechanical demands made upon it, behaving in this way almost like a sentient and intelligent creature. But the cause of this power must lie in the muscular walls of the heart itself, and a study of the conditions under which it occurs and the concomitant changes in the heart has revealed the secret of its wonderful power. The solution is simple. We find that, in the isolated heart, every increased resistance to its contraction is associated with an increased diastolic volume of the cavity or cavities, which have to overcome the resistance. Putting the matter in another way, we may say that the larger the diastolic volume of a given heart, the greater is the force of the contraction which immediately ensues. The energy of contraction is therefore a function of the diastolic volume of the heart. Dilatation of this organ is not merely a pathological phenomenon, but is the means by which the heart achieves its purpose, and maintains an activity which varies with the needs of the organism for more or less blood.

In this relation we find also the secret of the power of compensation, such as occurs in cases of valvular disease, and has been always a puzzle to pathologists. Injury, for instance, to an aortic valve, with the production of regurgitation, causes increased filling of the left ventricle at the following diastole, since this receives blood not only in the ordinary way from the pulmonary veins and left auricle but also by a reflux through the damaged valve. The dilatation invokes an immediate increase in the force of the contraction, so that within a few beats the left ventricle sends on into the aorta the total amount of blood flowing into it during the preceding diastole, and the aorta receives sufficient blood not only to supply the body, but to make up for the amount leaking back through the damaged valve. The same reasoning applies to the compensation which occurs for any valve lesion, whether it be of the nature of a leak or of a stenosis, increased filling or increased resistance; and in an otherwise healthy individual constant increase in work has as a secondary result increased growth and hypertrophy of the cardiac muscle, so as to make it fit to meet the abnormally increased demands throughout the life of the individual.

You will remember that Harvey insists on the essentially muscular nature of the heart. "It was not without good grounds," he says, "that Hippocrates in his book *De Corde* entitles it a muscle; as its action is the same, so is its function, namely, to contract and move something else." Increasing dilatation of the heart means increased length of its muscular fibres, so that we can express the law of the heart as a relation between length and energy—the longer the muscle fibre the greater the energy of its contraction. In this form we find that the law of the heart is that of all muscular tissue, whether voluntary or involuntary. The Swedish physiologist Blix showed many years ago that the energy evolved in the contraction of a frog's muscle was proportional to its initial length, and A. V. Hill has proved that this holds good for the heat production during activity, and therefore for the total chemical changes which are responsible for the contraction and recovery of the muscle. So that in searching after the cause of the heart's power of adaptation we are brought into the region of final causes, in which we associate function with structure, and see in muscular contraction the expression of molecular changes occurring at the surface of longitudinal fibrillae. Thus we bring together in one formula the sum total of our experiences with regard to the nature of excitation itself, development of mechanical energy, and the chemical, electrical, and heat changes which accompany muscular contraction. We are still far from a complete understanding of these matters, and still farther from any possibility of reconstructing a muscle fibre. But the path, so far as we can see along it, seems to lead to no impassable barrier, and to promise a complete description of the acts of excitation and contraction as molecular events occurring at surfaces.

The Limits of Adaptation.

Is there any limit to this power of adaptation? In skeletal muscle an increase in the length of the muscle fibres leads to an augmentation of the energy changes of contraction, succeeded later by a diminution as the muscle becomes overstretched. In the healthy mammalian heart the limits are set by the strength of the muscle fibres themselves. Freed from the pericardium, we find the heart goes on increasing the strength of its contraction with increasing dilatation until the muscle fibres are actually ruptured; and when the heart finally fails we find its substance beset with haemorrhages. In the body this overstrain of the heart is prevented by the tough fibrous sac of the pericardium. When the demand on the heart is so great that the heart dilates to the limits of the pericardium, any further dilatation and therefore increased strength of beat becomes impossible; the output therefore falls off, and in the whole animal this diminished output results in defective supply of blood to the muscles and brain, giving rise often to fainting and at any rate enforcing complete rest. Further activity of the animal becomes impossible, and the heart is automatically given less work to do, so that it can recover, unless the increased activity of the animal and of the heart is a necessary condition of the animal's continued survival, as in a fight to the death. In this case when the heart comes up against the pericardium the fight is finished and the animal succumbs. We find the same story in the terminal changes of heart disease, where the process of compensation which I have described above becomes insufficient. Here again enforced rest may give time and opportunity for re-establishment of a sufficient circulation; but with advance of the fundamental morbid condition, even complete rest becomes powerless to relieve the heart: the output falls off, the circulation is insufficient for the needs of the tissues, and we get all the secondary results of failure of compensation—suppression of urinary secretion, waterlogging of the body, and malnutrition of all its organs which usher in the fatal termination.

During the last few years great advances have been made in our knowledge of the causation of many of these morbid conditions, and this increased knowledge has, as always, enhanced our powers of dealing with such cases, of staying the course of the disease or delaying its fatal issue. It is interesting to note that these advances are the direct outcome of researches made with the sole object of elucidating the intimate nature of muscular contraction. In his book Harvey remarks: "Of these things we shall speak more opportunely when we come to speculate upon the final cause of this motion of the heart." Such speculation at that time would have been in vain. It seems probable that he anticipated finding the solution in the study of the generation of animals, but we know now that to penetrate more deeply into the final cause of the action either of skeletal muscles or of the heart requires a physical and chemical knowledge which even now we are only beginning to attain. I would remind you that the string galvanometer, the employment of which has thrown so much light on the essential nature of disturbances in the heart rhythm, was invented by Einthoven with a view to studying the electrical changes accompanying activity in any kind of tissue.

The Inherent Contractile Power of the Heart.

In dealing with the origin of the rhythmic power of the heart Harvey rightly ascribes it to the heart muscle itself, and brushes aside any suggestion that it is dependent on the nervous system, or the liver, or any other organ. His assurance on this point was due to his observation of the developing chick, in which the first sign of life was the pulsating spot of blood in the region where the heart was being formed. It is interesting to note that it is the same method—namely, the investigation of development—which has settled the question of the seat of the rhythmic power of the heart and has revealed to us the origin and course of the rhythmically recurring wave of contraction in the heart of man. By means of a technique, first devised by Harrison in the United States, it is possible to cultivate living tissues outside the body, in much the same way as we have learned to grow micro-organisms. Using great care to exclude infection, we are able to transfer to plasma or salt solution on a glass slide fragments of tissue which, being kept warm, live and multiply. From such a preparation further generations can be brought up, and in one such case a preparation of the muscle cells of the heart of a chick has been kept alive, growing and dividing, for twelve years, a time far beyond the natural span of the life of the fowl. Such a result proves that mortality is but an accident of the complexity of our living machine and not a necessary quality and fate of the tissues of which the body is composed. But during these twelve years the muscle cells have not ceased to contract rhythmically, showing that in their peculiar properties must be sought the origin of the rhythmic beat of the heart, thus finally disposing of the various views which have been held, according to which the origin of the heart beat was to be sought in the nervous ganglion cells and fibres present in different parts of this organ.

And it is by the embryological method—that is, by observing the processes of generation—that Keith and Flack were able to lay the anatomic foundations of our present knowledge of the origin and course of the contractile processes in the heart of the higher animals. In the developing heart, as in the lower vertebrates, the beat originates in that part of the contractile tube which later will form the sinus venosus. In the course of the changes undergone during development, Keith showed that this sinus tissue persisted at definite parts of the mature heart and could be distinguished under the microscope from the surrounding parts of the heart. This special sinus tissue was given the name of the sino-auricular node and the auriculo-ventricular node.

The Cardiac Cycle.

The brilliant experiments by our distinguished Fellow, Sir Thomas Lewis, have resulted in a complete knowledge of the part played by these nodes in the cycle of the heart's contraction. He has shown how the sino-auricular node is the pace-maker of the heart, how the contractile process originating here spreads through the auricular

muscle to the auriculo-ventricular node, and then passes rapidly through the bundle of specialized muscular tissue, known as the A-V bundle, to all parts of both ventricles. We have in this bundle an interesting example of a muscular tissue differentiated to serve the propagation of excitation rather than for contraction, so that it closely resembles nerve in the manner of its function. To the same fine and careful experimenter we owe the explanation of one of the commonest conditions of the diseased heart—namely, auricular fibrillation or delirium, which is responsible for the irregular ventricular contractions, often leading rapidly to exhaustion and failure of the heart. It is remarkable that the clue to the explanation of this condition was first given by the observations of Romanes on the contractile tissue of jellyfish, which by its rhythmic pulsation propels these graceful animals through the sea-water. It was shown by Mayer for the jellyfish and by Mines for the frog's heart that it was possible to obtain a ring of contractile tissue in which a wave of contraction passed continuously round the ring, and the merit of Lewis's observations is the proof that delirium is of the same nature as this circus movement, so that the contractile wave continually progresses over the muscular tissue, exciting each part in turn but in a completely inco-ordinate fashion. It was long ago shown by Marey that the rhythmicity of the heart was bound up with the prolonged refractory period affecting the heart muscle after its contraction, during which period it was insusceptible to any form of excitation. Lewis has shown that the circus movements which are responsible for fibrillation are due to a disturbance in the normal relation between the rate of conduction of the excitatory process and the refractory period in the heart muscle. Thus instead of an orderly progression of impulses from one node to the next and so to the auriculo-ventricular bundle and ventricles, every individual fibre is contracting rhythmically but independently of what is happening in its surroundings.

The Central Nervous System and the Heart.

Time will not allow me to deal with the manner in which the heart, already so perfect as it would seem in its power of adaptation, is controlled by the central nervous system, so that the adaptation to changes in the environment and to the needs of the most distant parts of the body can be carried out with greater perfection and with the least possible drain on the energies of the heart muscle. Among such adaptations must be included those attendant on the emotions—"every affection of the mind that is attended by either pain or pleasure is the cause of an agitation whose influence extends to the heart." But indeed, Harvey's treatise, being the foundation of modern physiology, might serve as a text to a commentary, from which but little of our present-day knowledge of the organs of the body could properly be omitted.

I should like, however, to be permitted to allude to another chapter in modern physiology, which can be said to have grown out of Harvey's discovery of the circulation of the blood, and which is becoming every day of increasing importance.

Hormones.

In the dedication to his work Harvey compares the heart to the sovereign king, and throughout he continually recurs to what we should now describe as the "integrative function" of this organ. In virtue of the circulation which it maintains, all parts of the body are bathed in a common medium from which each cell can pick up whatever it requires for its needs, while giving off in return the products of its activity. In this way each cell works for all others—the lungs supply every part with oxygen and turn out the carbon dioxide which they produce, the alimentary canal digests and absorbs for all, while the kidneys are the common means of excretion of the soluble waste products of the body. Changes in any one organ may therefore affect the nutrition and function of all other organs, which are thus all members one of another. But, in addition to enabling this community of goods, the circulation affords opportunity for a more private intercourse between two or at any rate a limited number of distant organs.

It is now eighteen years since I drew the attention of this College to the chemical messengers or hormones which are employed by the body for this purpose. As an illustration of the method by which they work, I adduced the example of carbonic acid gas, which is the product of all cellular activity and at the same time has a specific excitatory effect on the respiratory centre, so that the respiratory movements keep pace with the needs of the whole body for oxygen. The typical hormone, however, is a drug-like body of definite chemical composition, which in a few cases is actually known, so that the substance has been synthesized outside the body. It is more or less diffusible and may even withstand without alteration the temperature of boiling water. It is generally easily oxidizable in a neutral or alkaline medium, so that after its production it does not remain long in the blood; it delivers its message and is then destroyed. Each specific hormone is manufactured by a group of cells and turned into the blood, in which it travels to all parts of the body, but excites definite reactions in one or a limited number of distant organs. The production and action of these substances are continually going on in the normal animal. They are necessary to health and their production in excess or in deficit give rise to disease and maybe to death. Typical of these substances is secretin, a substance produced in the epithelial cells lining the upper part of the small intestine when these come in contact with weak acid, so that it is produced in normal circumstances by the passage of the acid chyme from the stomach into the duodenum. Directly it is produced it is absorbed into the blood and travels round to the pancreas, to the liver, and to the intestinal glands, in all of which it excites secretion. By means of this chemical reflex the arrival of the products of gastric digestion in the small intestine evokes within a couple of minutes the secretion of the three juices whose co-operation is necessary for completing the work of digestion and solution of the food already begun in the stomach. It is probable that this mechanism is but one of a whole chain of chemical reflexes responsible for the orderly progression of the various stages in the digestion of food.

These hormones may apparently be formed by any kind of tissue. In many cases a gland which has, in the evolutionary history of the race, poured its secretion by a duct into the alimentary canal or on to the exterior, loses its duct and becomes a ductless gland, the secretion being now transferred either immediately or through the lymphatics into the blood stream. In either case these chemical messengers may be formed from masses of cells which have at no time had a glandular structure and may be modified nervous tissue, germinal tissue, or some part of the mesoblast.

The Thyroid.

As a type of the ductless gland derived from one with an external secretion the most familiar example is the thyroid. The physiological action of its internal secretion and the morbid results of its excess or deficiency, affecting tissue growth and development, metabolism and mentality, are familiar to all. In recent years the active substance has been actually isolated, and its constitution determined, by Kendal, who has shown that it is an iodine derivative of an amino-acid, tryptophane. It seems almost a fairy tale that such widespread results, affecting every aspect of a man's life, should be conditioned by the presence or absence in the body of infinitesimal quantities of a substance which by its formula does not seem to stand out from the thousands of other substances with which organic chemistry has made us familiar.

The Sexual Hormones.

But although we do not yet know their constitution, the chemical messengers associated with the reproductive organs are possibly even more marvellous in the influence they exert on the different parts and functions of the body. The effects of castration have been the subject of observation almost from the beginnings of civilization, but it is only during the

last few years that definite proof has been brought forward showing that these effects are due to the removal of chemical messengers normally produced in the testes. The whole differentiation of sex, and the formation of secondary sexual characters, are determined by the circulation in the blood of chemical substances produced either in the germ cells themselves or, as seems more probable, in the interstitial cells of the testis and ovary, which themselves are probably derived from the germ cells of the embryo. Thus it is possible by operating at an early age to transfer male into female and vice versa. Removal of the ovaries from a hen causes the assumption of male plumage; the removal from a young cock of the testes and their replacement by the implantation of ovaries cause a disappearance of the comb and the assumption of the plumage of the hen. Each animal as concerns its general build and colour has a neutral form which, as has been shown by Pézard, results from the extirpation of either testes or ovaries. In fowls the neutral form, as judged by the plumage, approximates the male, whereas in sheep the neutral form resembles the female. There is no question that, by the implantation of ovaries or testes into the foetus at a sufficiently early age, one could produce the whole development of the internal and external genitalia corresponding to the sex of the gland implanted. It is worthy of note that these sex characters affect also the mentality and the reactions of the animal, although they are quite independent of any nervous connexions. Here, as in the case of the thyroid, the functions of the central nervous system in their highest manifestations depend on the circulation in the blood of chemical substances or hormones. The wonderful development that takes place in the female after conception to fit her to nourish the foetus as well as the young child, is also due to hormones, produced in some cases perhaps in the ovaries, in other cases in the product of conception itself.

The Hormone of the Adrenal Medulla.

We owe to Schafer the knowledge of the internal secretion of the medulla of the suprarenal bodies. As Cannon has pointed out, this secretion is poured into the blood during conditions of stress, anger, or fear, and acts as a potent reinforcement to the energies of the body. It increases the tone of the blood vessels, as well as the power of the heart's contraction, while it mobilizes the sugar bound up in the liver, so that the muscles may be supplied with the most readily available source of energy in the struggle to which these emotional states are the essential precursors or concomitants.

The Pituitary Hormones.

Wonderful, too, is the influence exerted by the secretions of the pituitary body. This tiny organ, which was formerly imagined to furnish the mucus to the nasal cavities, consists of two lobes which have different internal secretions. That produced by the anterior lobe seems to influence growth, excess producing gigantism or acromegaly, while deficiency leads to retarded growth and infantilism. The posterior lobe, which in aspect would seem but a small collection of neuroglia, nevertheless forms one or more substances which, circulating in the blood, have the most diverse influences on various parts of the body. They cause contraction of the uterus and of the blood vessels (these are possibly two distinct substances); they may increase or diminish the flow of urine; they affect the excretion of chlorides by the kidney; and, according to Krogh, their constant presence in the blood is essential for maintaining the normal tone of the capillaries. In the frog the post-pituitary hormone is responsible for the protective adaptation of the colour of the skin to the environment, an adaptation which is effected by retraction or expansion of the pigment cells or chromatophores of the skin; and if we may accept Kammerer's conclusions, the pituitary hormone which is poured into the blood for this purpose affects the germ cells themselves, so that individuals born of parents that have lived in light or dark surroundings are correspondingly light or dark—a real transmission of acquired peculiarities, effected not by the gemmules of Darwin, but by the influence of a soluble diffusible hormone on the germ plasm.

Integration of Functions.

In the multiplicity and diversity of the physiological effects produced by these various chemical messengers one is apt to lose sight of the fact that we are here investigating one of the fundamental means for the integration of the functions of the body. These are not merely interesting facts which form a pretty story, but they are pregnant of possibilities for our control of the processes of the body and therewith for our mastery of disease. Already medical science can boast of notable achievements in this direction. The conversion of a stunted, pot-bellied, slavering cretin into a pretty attractive child by the administration of thyroid, and the restoration of normal health and personality to a sufferer from Graves's disease by the removal of the excess of thyroid gland, must always impress us as almost miraculous. In the same way we may cure or control for the time being diabetes insipidus by the injection of the watery extract of the posterior lobe of the pituitary body. The latest achievement in this direction is the preparation by Banting and Best in Canada of the active principle normally formed in the islets of the pancreas, and the proof that the diabetic condition in its severest forms can be relieved by its subcutaneous administration.

The Therapeutics of Hormones.

In my Croonian Lectures I asserted that if a mutual control of the different functions of the body be largely determined by the production of definite chemical substances in the body, the discovery of the nature of these substances will enable us to interpose at any desired phase in these functions, and so to acquire an absolute control over the workings of the human body. I think I may claim that, in the eighteen years that have since elapsed, we have made considerable progress towards the realization of this power of control which is the goal of medical science. But there still remains much to be done and many difficulties to be unravelled, and it may be worth our while to consider along what lines researches to this end must be directed. There are no doubt many hormonic relationships of which at present we are unaware, since every year research adds to their number. But assuming we know that such and such an organ produces an internal secretion which is necessary for the normal carrying on of a given function or functions, we may desire to diminish or enhance its effects in a patient or to replace it when it seems to be entirely lacking. There seem to be three possible methods by which we medical men can interpose our art in the hormonic workings of the body.

I.

In the first place we may find what is the effective stimulus to the production of the hormone, and, by supplying this, increase its production by the responsible cells. For instance, we know that by the administration of acid, or at any rate by increasing the passage of weak acid from the stomach to the duodenum, we can enhance the production of secretin and so of pancreatic juice and the other juices. Probably, therefore, when we give dilute acids to assist gastric digestion, we are setting into motion the whole chain of reflex processes in the alimentary canal, and the chief value of our administration may be its effect on the pancreas. But in a large number of cases we do not yet know what is the effective stimulus to the production of these internal secretions. In the case of the adrenals we know the secretion can be augmented through the central nervous system and the splanchnic nerve under the influence of emotions or of lack of oxygen, but we have no knowledge of the factors determining the production of the pituitary hormones or of insulin by the islets of Langerhans, and this condition of ignorance extends to most of the other ductless glands.

In some cases deficient production of a hormone may be due to the absence from the food and drink of some necessary constituent. Thus iodine is essential to the formation of the specific secretion of the thyroid gland (iodothyrin).

If iodine be entirely absent from the drinking water and the soil, so that it is not contained even in minute quantities in the vegetable food grown in the district, the thyroid undergoes hyperplasia—in a vain endeavour to make bricks without straw, to produce its proper hormone without iodine. This seems to be the cause of the great prevalence of simple goitre in certain districts—especially in Switzerland and in parts of the United States. It has been shown that goitre can be practically eliminated from these districts by the occasional administration of small doses of iodine or iodides (Marine, Lenhart, Kimbull and Rogoff). These results were communicated in 1917 to Dr. Klinger of Zürich, and as a result of his experience the Swiss Goitre Commission has recommended the adoption of this method of goitre prevention as a public health measure throughout the entire State. Already great progress has been made in the abolition of this disease from the country. Thus the incidence of goitre among all the school children of the canton of St. Gallen has been reduced from 87.6 per cent. in January, 1919, to 13.1 per cent. in January, 1922.

II.

Where a disordered condition is due to diminished production of some specific hormone we may extract the hormone from the corresponding gland or tissue in animals. It is characteristic of these hormones that, so far as we know, they are identical throughout all the classes of vertebrates, and it is possible that they may be found far back in the invertebrate world. This method is easy when, as in the case of the thyroid, the active principle is stored up in the gland and is unaltered by the processes of digestion, so that we can obtain all the curative effects of the hormone if we administer dried thyroid by the mouth. We have no evidence that any other of the hormones with which we are acquainted partake of this resistance to digestion, so that to produce their specific effects they have to be introduced by subcutaneous injection—a great drawback when the administration has to provide for the constant presence of a small concentration of the hormone in the blood and tissues. In the case of insulin, for instance, it seems necessary to repeat the injection every twelve hours to obtain any continuity of action, and the same thing probably applies to the pituitary extract, while in the case of the genital hormones no reliable effect has been obtained except by the actual implantation of the organ from an animal of the same family.* We may, however, look forward to the day when the chemical constitution of all these hormones will be known, and when it may be possible to synthesize them in any desired quantity. We may then be able to overcome the inconvenience of subcutaneous injection by giving relatively colossal doses by the mouth, or we may be able to modify their constitution to a slight extent so as to render them immune to the action of digesting fluids without affecting their specific action on the functions of the body.

III.

The ideal, but not, I venture to assert, the unattainable, method will be to control, by promotion or suppression, the growth of the cells themselves whose function it is to form these specific hormones. Though this method seems at present far from realization the first steps in this direction have already been taken. It must be remembered that the power of controlling growth of cells involves the solution of the problem of cancer. Here the experiments on the growth of normal cells outside the body have shown that they can be stimulated to vie with cancer cells in the rate of their growth, or can be inhibited altogether according to the nature of the chemical substances with which they are supplied. And we know that the growth of certain cells, such as those of the mammary gland or of the uterus, is excited by specific chemical substances produced in the ovary or foetus; and we may be able to find specific substances or conditions for any tissue of the body which may excite growth which is retarded, or diminish growth when this is in excess. It may be that in some cases purely mechanical interference will suffice. Thus in experiments by Steinach and others it has been found that ligature of the vas deferens close to the testis, while causing atrophy of the seminiferous cells, brings about overgrowth of the interstitial cells, which, as we have seen, are chiefly responsible for the hormones determining the secondary sexual characters. Among these secondary sexual characters must be classed the whole of a man's energies. Virility does not mean simply the power of propagation, but connotes the whole part played by a man in his work within the community. As a result of this hypertrophy these authors claim to have produced an actual rejuvenation in man, and thus to have warded off for a time senility with its mental and corporeal manifestations. Further experiments and a longer period of observation are necessary before we can accept these results without reserve, but it must be owned that they are perfectly reasonable and follow, as a logical sequence, many years' observations and experiments in this field.

It would indeed be an advantage if we could postpone the slowly increasing incapacity which affects us all after a certain age has been passed. Pleasant as it would be to ourselves, it would be still more valuable to an old community such as ours, where the arrival of men in places of rule and responsibility coincides as a rule with the epoch at which their powers are beginning to diminish. The ideal condition would be one in which the senile changes affected all parts of the body simultaneously, so that the individual died apparently in the height of his powers. For it must not be thought that in any such way we could prolong life indefinitely. Pearl has pointed out that if all the ordinary causes of premature death were eliminated, this would increase the average duration of life by not more than thirteen years. On the other hand, he shows that the children of long-lived parents have an expectation of life which is twenty years greater than that of the average individual.

It is evident, then, that if longevity is our goal it is not medical science we must look to but eugenics, and I doubt whether the question is one with which we are concerned. The sorrow of life is not the eternal sleep that comes to everyone at the end of his allotted span of years, when man rests from his labours. It is the pain, mental and physical, associated with sickness and disability, or the cutting off of a man by disease in the prime of life, when he should have had many years of work before him. To us falls the task of alleviating and preventing this sorrow. In our childhood most of us learnt that suffering and death came into the world through sin. Now, when as physicians we stand on the other side of good and evil, we know that the sin for which man is continuously paying the penalty is not necessarily failure to comply with some one or other of the rough tribal adjustments to the environment, which we call morality, but always and in every case ignorance or disregard of the immutable working of the forces of Nature which is being continually revealed to us by scientific investigation. In spite of the marvellous increase in knowledge, to some aspects of which I have drawn your attention, suffering is still widespread amongst us. Only by following out the injunction of our great predecessor—to search out and study the secrets of Nature by way of experiment—can we hope to attain to a comprehension of "the wisdom of the body and of the understanding of the heart," and thereby to the mastery of disease and pain which will enable us to relieve the burden of mankind.

* In my Croonian Lectures in 1905 I reported some experiments made in conjunction with Dr. Lane-Claypon, in which I had produced hypertrophy of the mammary glands in virgin rabbits, and in some cases actual milk production, by the daily subcutaneous injection of the filtered watery extract of young rabbit foetuses. Similar results were obtained by Foà. But a weak point in these experiments was that the ovaries had not been previously extirpated. Ancel and Bouin have shown that in the rabbit the mere rupture and discharge of a Graafian follicle, with the subsequent growth of a corpus luteum, are sufficient to cause hypertrophy of the mammary glands (the effective hormone presumably having its seat of manufacture in the luteal cells). It seems possible, therefore, that the effect of our injections may have been on the ovaries, and that the growth of the mammary glands was only a secondary and indirect result. I do not therefore now regard our experiments as conclusive.

Cameron Prize Lectures

ON

THE PRESENT POSITION OF THE VITAMIN PROBLEM.

DELIVERED IN THE UNIVERSITY OF EDINBURGH,
JUNE 27TH AND 28TH, 1923,

BY

F. GOWLAND HOPKINS, D.Sc., F.R.S.,
PROFESSOR OF BIOCHEMISTRY IN THE UNIVERSITY OF CAMBRIDGE.

LECTURE I.

I FIND that the Cameron Prize which I have had the honour of receiving from the University of Edinburgh is awarded for contributions to the advance of practical therapeutics. I cannot claim, however, to have had any influence whatever upon the progress of this branch of knowledge, save perhaps in a very humble degree with respect to deficiency diseases and their prevention and cure by dietetic adjustments. Modern developments tend more and more to make dietetics a branch of therapeutics, and part at least of this tendency is due to the discovery and study of dietetic essentials which we have agreed to call vitamins. Lecturing, then, as the honoured recipient of a prize possessing the associations just mentioned, I find that to take vitamins as my subject is almost a logical necessity. Otherwise, I think, I would not have chosen just the present moment for a discussion of these elusive substances. I have some faith that we are near the moment when the constitution of one or another of them will be known. Then, indeed, both lecturer and audience might find greater pleasure in considering them.

Since the necessity of postulating the existence of factors in diet of which the concentration is very small, but the importance very great, became evident (and there can be no doubt of that necessity), much work has been done in the endeavour to discover what may be the nature of these factors. That end has not yet been reached, and as a consequence all discussion must suffer from definite limitations. But the real and objective existence of vitamins must not be doubted, and I feel the more tempted to express here and now a strong opinion on this point because it is in Scotland, and I think, save very early, in Scotland alone, that doubts about their existence—or perhaps I ought to say doubts about their practical importance in dietetics—have arisen.

When I recall certain published statements and certain oral expressions of opinion which have emanated from two important northern centres of scientific activity, I almost feel that I have crossed the border to accept a challenge!

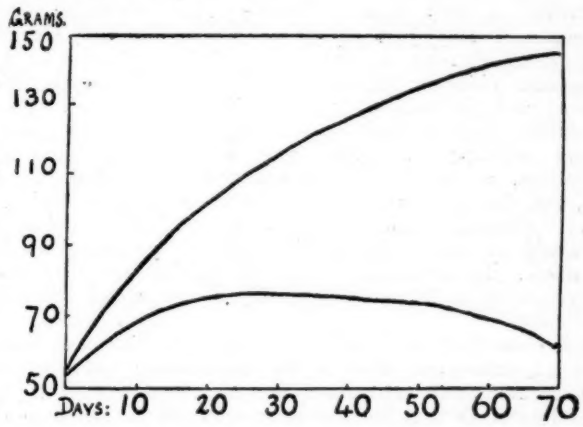
It may be, and it is not surprising, that in certain quarters the importance of the subject has been exaggerated or its significance distorted. Unhappily, it seems that no line of genuine scientific study which bears in any way upon the food of mankind can escape attention and misrepresentation at the hands of the quack, the trade advertiser, and the less informed press. The intelligent public is made tired of facts before they have time to become fully established. Moreover, as in other subjects of inquiry calling for a technique which is apparently simple, amateur investigators have been active in this domain, and not all that has been written about it is sound. It would, however, be, I think, disastrous if those who have no time to appraise the evidence as a whole should receive any general impression that it is other than conclusive.

As you well know, the last century closed with a consensus of opinion on the part of students of nutrition that the main determinant of dietetic efficiency was the energy value of the food consumed. The view tended to crystallize into the form of Rubner's law of isodynamic equivalence. One foodstuff might, it was taught, with unimportant limitations be replaced by another so long as the total energy supplied was undisturbed. The only foodstuffs calling for serious consideration—it was also taught—are proteins, fats, carbohydrates, and mineral salts. Such was orthodoxy even ten years ago. The change which has come over our views concerning nutrition may be sufficiently described as one involving a greater recognition of the qualitative factor in diets; a recognition which, of course, leaves the importance of quantitative factors quite undisturbed.

In a limited sense the law of isodynamic equivalence is true and indisputable. Because the body as a physical system is subject to the first law of thermodynamics the energy it gives out must be proportional to the energy liberated from its food, whether this liberation occurs on physiological lines or not. But the body is not a heat engine. Its machinery and its fuel are not to be sharply distinguished. Energy must be liberated in various forms, in the right places, and with due regard to certain sequences. Much of this organization is due to the influence within the body of the chemical agents which we call hormones. It may be that we can best define the substances we are considering by thinking of them as exogenous hormones—a term due, I think, to Sir Archibald Garrod.

Even the classical teaching of the latter part of the nineteenth century had to reckon with the specific nutrient properties of protein, but there was a tendency to minimize the importance even of these. It is now clear that protein is not the only dietary constituent with highly specific functions, and we know, moreover, that it is not true to say that a quantitative sufficiency of proteins, fats, carbohydrates, and minerals makes a diet physiological. The long dominant assumption that it did so always lacked a proper basis, because that sufficiency had never been tested on pure materials. The actual fact is that a dietary consisting of pure protein, pure fat, pure carbohydrate, and a fully efficient salt supply may be well digested, normally absorbed, and duly oxidized in the body of an animal, while wholly failing to support it. This highly significant fact is firmly based upon experimental results which are easy to obtain and always reproducible. Not less significant is the complementary fact that such a diet can be made efficient by additions which are quantitatively almost infinitesimal.

I apologize for asking attention here to the results of an experiment which is of a kind now very familiar. I would like the fundamental facts just mentioned to be freshly in mind before I proceed.



The results in question were obtained by myself, but they represent the experience of many investigators. The lower curve in the diagram shows the average growth exhibited by ten animals placed on a synthetic diet in which the only fat constituent was a purified vegetable fat. The upper curve shows the growth of ten similar animals upon the same diet, with the sole difference that each received in addition 5 milligrams per diem of crude cod-liver oil. The animals in the former set, it will be seen, all ceased to grow. By the seventieth day six out of the ten were showing serious lesions of the eyes, and all would have soon died had not their diet been altered. Those in the second set grew well, as the curve shows, and remained in good health until the experiment ceased after seventy days. The addition which made the difference between health and ill health, and

ultimately between life and death, amounted quantitatively to one part in twenty-five hundred of the total food eaten. We now know that if a particular fraction of the oil had been given, instead of the intact oil, the amount might have been much less than this.

Such facts, abundantly confirmed as they are, surely imply that the dogmatic teaching of twenty years ago must be profoundly modified; they have indeed no inherent lack of probability which would justifiably stand in the way of their frank acceptance. We are familiar in quite other connexions with the potent influence which infinitesimal quantities of specific material may exert in biological phenomena. In the region of nutrition itself we have been learning that even micro-organisms with highly developed synthetic powers may require in their environment substances which specifically stimulate growth, and this especially when they are adjusted to parasitic habits and therefore to complex media. The animal is essentially parasitic upon the green plant, and there is no reason why its needs should be confined to the substances which the plant makes in large amount. It is sure from the work of recent years that if we wish criteria for an adequate diet we must not confine our consideration to pounds and ounces, nor, for that matter, to calories. This is a scientific certainty; whether it has practical importance is a matter for separate consideration.

I have so far spoken almost as though I were putting before you a new and unfamiliar subject. My only justification for doing so is that I feel these general observations will provide a background for the presentation of some technical details. I can in reality, of course, assume a general familiarity with the facts. I must do so, indeed, if in the short time at my disposal I am to attempt a personal estimate of the present outlook. All I can do, indeed, is to report upon certain facts established by the most recent researches which seem to make firmer the basis for a belief in the objective reality of these accessory nutrients, and to illustrate the practical importance of their study.

I can assume your acquaintance with the fact that at least three distinct substances are known to exist which conform to the only available definition of a vitamin. Each possesses, that is to say, a nutritive importance which is very great, while its actual concentration in natural foodstuffs is very small. Perhaps, for convenience of reference, I may just enumerate them, familiar though they be. They are: (1) vitamin A, originally known as the fat-soluble vitamin; (2) vitamin B, the antineuritic substance; and (3) vitamin C, the antiscorbutic factor. That we should speak of them in this non-committal way, with merely alphabetical labels, was a suggestion due to McCollum, which at present seems well justified. It is well, too, that we should adopt Drummond's suggestion and write "vitamin" instead of "vitamine," as by doing so we avoid certain unjustifiable chemical connotations in the name. In my second lecture it will become clear that the vitamins A, B, and C probably do not stand alone in their class.

It is clear that if the distribution, properties, and functions of substances are to be established, quantitative methods for their estimation are a prime necessity. It is no less clear that to find such methods in the case of substances which have not been isolated, and cannot therefore be weighed, is no easy task. Nevertheless, owing to pioneer efforts made years ago at the Lister Institute, and to the later work of many—in particular that of Osborn and Mendel, of Drummond and Zilva, and of Mottram—it may be honestly claimed that we have now a technique of sufficient accuracy in the quantitative sense for the establishment of many definite conclusions. This technique is based upon biological experimentation. It consists essentially in determining the minimal amount (or the relative amount in comparison with a standard preparation) of the material under study which will induce certain observable effects in a standard animal—the smallest amount, for instance, which, when added to a dietary previously proved not to maintain growth, will enable this normal growth to occur in a young animal; or the amount which will prevent or remove symptoms experimentally produced in an animal by deprivation of the particular vitamin in question. I must not stop to discuss the details of technique. All cautious observers have found that such methods call for experience, and call for standardization, but all agree that reliable results are to be obtained. The number of such observers is becoming legion. Experiments which began in this country and were immediately prosecuted with great enterprise in the United States are now being carried out in almost every civilized country.

The application of the above methods is continuously increasing our knowledge of the exact *distribution* of vitamins. This assuredly, if we are to believe at all in their significance, is a subject of much practical importance, but one upon which I need not dwell.

We are learning much that is interesting concerning the *origin* of vitamins. Although the statement may ultimately have to be qualified, it may be said generally that it is to the plant cell we must look as the essential place of origin. Vitamins arise in the green plant as the result of photosynthesis, though in the case of A at least, to judge from the work of Coward and Drummond, as part of events which are independent of the chlorophyll function. The relatively great stores of A which accumulate in the livers of fish take origin from the diatoms and algae of the sea (Hjort; Coward and Drummond).

Concerning the general *chemical and physical properties* of vitamins there is one statement to be made which is of considerable practical importance. There long existed a very general belief that these substances as a class were easily destroyed by heat, and upon this was based the popular assumption that any form of cooking necessarily reduces the vitamin content of natural foods. It must not be supposed that this belief is wholly wrong, but it requires considerable modification. Three years ago I was able to establish the fact that the vitamin A is resistant to heat though very prone to destruction by oxidation. Since then various observers, in particular Hess and Zilva, have shown that the same is true of vitamin C. Zilva has further determined very carefully the conditions which make for stability in the case of the latter (the antiscorbutic) substance. He found, for instance, that decitrated lemon juice when left slightly acid (*p*H 6.8) could be boiled for two hours in an atmosphere of carbon dioxide without loss of antiscorbutic potency. By boiling, however, for only one hour in a current of air the potency was greatly reduced. The process of oxidation, which in the latter case was mainly responsible for the destruction, occurs much more slowly if the fluid be rendered more acid. At *p*H 2.2, for instance, oxidation is found to be quite slow. In the alkaline condition vitamin C is much less stable, though in this case also it is oxidation rather than the effect of heat which determines its rapid destruction (Harden, Zilva). The vitamin B has long been known to be resistant to heat.

It follows from the facts just enumerated that if access of oxygen be avoided foodstuffs may be heated to boiling point with relatively little danger from the standpoint of vitamin destruction. It should be remembered, however, that ordinary cooking operations in no case wholly exclude oxidation.

Considerable progress is being made in our knowledge of other chemical and physical properties of the individual vitamins. This knowledge, together with a realization of the conditions which make for their stability, is notably assisting current attempts to isolate the substances. Although in no case has final success been reached, preparations of each vitamin have been obtained possessed of such potency as to indicate that they contain the active substance in a concentration enormously in excess of that in the original source.

In the case of vitamin A, for instance, several observers have been able so to fractionate cod-liver oil as to obtain a product of which much less than a milligram could serve as an efficient daily ration for a rat. Of the B vitamin Seidall has made a preparation capable of preventing polyneuritis in pigeons when administered in doses of at most 1 milligram. In spite of the high activity of such preparations the final endeavour to separate from them an active pure substance has so far proved in all

cases disappointing. Hofmeister, for instance, having made from rice meal a preparation which certainly contained vitamin B in relatively large amount, obtained from it a crystalline base, but nothing else which gave evidence of purity. The base proved quite inactive. The much earlier attempts of Casimir Funk ended in a similar way, and so twelve years ago did endeavours of my own. The pursuit of pure chemistry has never involved analytical problems of such complexity, and there exists no classical technique for their solution. Maybe we shall have to replace the familiar use of selective solvents and precipitants by some new technique. Some have felt that there may be hope in the adoption of physical methods such as electrical transport, or in the use of selective adsorbents, on the lines of Willstätter's current endeavours to isolate enzymes. Vitamins would seem to be considerably more stable than enzymes, and the work done in attempts to purify them has encouraged at any rate a faith that the problem will be solved. I have already ventured an opinion that we shall not have to wait very long before the constitution of one or other of them is known.

Much current work is being done in the endeavour to decide how vitamins produce their effect in the body. It has from the first been clear that the influence of each is exerted on specific lines. The clear differences in function demonstrated by differences in the effects of deprivation have indeed constituted the main evidence for our belief in their diversity. In studies of metabolism, however, it is well to remember that chemical events in the organism, though they may often be more or less isolated experimentally, form an organized whole. No one process in the body can be rendered abnormal without ultimate effects upon other processes. Since there is a harmonious concurrence of events in normal metabolism, and since vitamins individually affect different aspects of metabolism, it is not unlikely that an optimum supply in the food would be one in which—apart from the absolute amounts—a definite proportionality obtains among them. Some unpublished experiments of my own seem to show that within certain limits this is the case. Vitamin A and B were supplied to rats on a synthetic dietary. In one experiment each was supplied in very small quantity, but the amount of the one bore a definite ratio to the amount of the other; growth was maintained, but was subnormal. In a second experiment the absolute amounts were increased, but the ratio was undisturbed; growth was normal. Next both vitamins were given in relatively very large amounts, but with the ratio still the same; growth was again normal and the animal's health was undisturbed. When, however, in another case, animals received A in the small amount employed in the first experiment and at the same time took B in the large amount of the third experiment, they showed little or no growth and failed to flourish, though there were no acute symptoms to suggest a direct deleterious effect from the large dose of A. These experiments require extension. If the results are confirmed they will show in respect of vitamins the importance of that balance among factors which has been demonstrated by others in the case of the mineral constituents of diets, and which E. Mellanby has recently insisted upon in the case of still other constituents.

In the hope of discovering the seat and mode of action of individual vitamins some have studied the effects upon functions, and others the nature of the anatomical or histological changes in the organs, which result when the animal is deprived of one or another of these substances. The remarkably specific lesions in the cornea seen in animals which have lacked a supply of vitamin A have been very fully studied (Stevenson and Clark, Mori). The latest view is that the immediate effect is upon the lacrymal glands and the entire secretory apparatus of the eye. The failure of secretion leads to xerosis of the conjunctiva and eyeball, to which the destructive lesions in the cornea are secondary. Whether this be so or not there is no doubt that in avitaminosis the glandular organs are especially prone to suffer and the changes in them differ in kind and sequence from what is seen in actual starvation. McCarrison, several years ago, showed that in pigeons deprived of vitamin B, while most organs lose weight the adrenals increase to two or three times the weight of those of control birds. This I find occurs also in the rat. Certain secretions have been said to fail when vitamin B is absent, but causal relations here have not been fully established. Hess, Abderhalden, and others have found that the oxidizing capacity of the tissues is diminished in animals which have been deprived of vitamin B, and Funk has brought forward evidence that the functions of this vitamin have some special concern with carbohydrate metabolism. In estimating the present outlook it is well to remember that studies of the kind just indicated are continuously going on. They have not yet told us what precisely is the function or mode of action of any one vitamin, but they are making to that end. The results reported by various workers seem to be reproducible and are therefore real.

There is one suggestion sometimes made in criticism of observations such as those I have been discussing which those concerned have a right to resent. I mean the suggestion that we are not exploring the properties of nutrients unrecognized before, but are carelessly engaged in removing or supplying familiar necessities—a due supply of iron, for instance, or other minerals. This implies that those devoted to vitamin studies lack common sense. An unbiased and close consideration of the technique employed will show how essentially baseless the suggestion has been, even though here and there insufficient attention may have been given to a general balance in the experimental dietaries employed.

One important aspect of the whole matter calls for final reference. Some few, while accepting the results obtained from animal experiments, feel that it is easy to exaggerate their importance in human nutrition. There is, however, nothing more characteristic of recent studies than their tendency to emphasize this importance. Species differ in the details of metabolism, and different species differ in their response to lack of vitamins; but the differences shown are superficial. They comprise variations in the actual severity of particular symptoms and in the sequence of their occurrence. Fundamentally the events are the same. We now possess actual experimental data, quite apart from the more general evidence from deficiency diseases, which link the behaviour of the rat suffering from vitamin deficiency through that of higher animals to that of human subjects. Although it be true, as is so repeatedly said, that a civilized adult community suffers no danger from any lack of vitamins it is different (this too has been frequently said) with the children in that community. If the conception of vitamins were a myth, instead of an important corrective to older views concerning nutrition, its advent would yet, in my opinion, have served a useful purpose. The discussion which it has called forth during the last ten years has assisted in directing special attention to the importance of all that comes under the head of "quality," as distinct from quantity, in the food of children, and this, in my opinion, has already greatly benefited the community.

THE REGULATING AND REFLEX PROCESS.*

BY

P. T. HERRING, M.D.,

PROFESSOR OF PHYSIOLOGY, ST. ANDREWS UNIVERSITY, AND PHYSIOLOGIST TO THE ST. ANDREWS INSTITUTE FOR CLINICAL RESEARCH.

Part III.—THE IMPORTANCE OF THE SYNAPSE IN THE REFLEX OR REGULATING PROCESS.

The nerve impulse is practically invariable in strength, it being the property of the neurone to give a maximal response to any stimulus which is capable of setting it into activity. In the isolated nerve the strength of a nerve impulse can be cut down or even extinguished by subjecting the nerve to the vapour of certain anaesthetics, but it is doubtful if the strength of the anaesthetic required to do this can be attained in the body. Death would ensue much earlier from the effect of the anaesthetic

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upon other structures which are more susceptible to its action than the neurones. But we know that the end-result of a reflex, or any other form of nervous activity, is manifested in various degrees of strength, so that there must be some method of graduating the response of the effector organ. The individual nerve impulse is invariable, but the number and frequency of the nerve impulses in the neurone may vary within certain limits, as can also the number of neurones set into activity. The latter factor is probably the most important one in bringing about the graded response.

It is only seldom that the full activity of any organ or tissue of the body is required, and in some of them there is evidence that the active units are constantly varying. The phenomenon of fluctuation or variable activity can be demonstrated in the capillaries where changes are constantly occurring in the amount of circulation going on in any one capillary field. It is probable, though not certain, that the same phenomenon takes place in the nervous system. In the production of a minimal response in any effector only a few neurones suffice to carry the nerve impulses necessary, and it is likely that the ones actually employed are continually varying, there being active phases and resting phases for each individual neurone or groups of neurones. Such distribution of function is possible where there is a large reserve of units, and provides the body with a system which is capable of nicely graduated response to the widely different conditions it has to meet, and at the same time avoids the occurrence of fatigue in those parts of the nerve pathway, the synapses and receptive substances, which are susceptible to its incidence.

The first analysis of stimuli takes place in the receptors, which are so fashioned that normally they respond only to certain forms of energy. Light is the only stimulus which is normally capable of exciting the receptors of the retina, and is ineffective elsewhere. Similarly heat, cold, tactile impressions, and other stimuli, can only excite nerve impulses if they meet with receptors which they are capable of stimulating. If suitable receptors are not present in a tissue the stimulus is incapable of exciting nerve impulses unless it is so gross as to be a direct excitant of the neurone itself. The tissue is therefore incapable of sensation and of reflex response to such stimuli. On the other hand, forms of energy which can excite the receptors present set up nerve impulses which are carried by afferent neurones into the central nervous system. The individual nerve impulse is the same, no matter what its origin may be, so that its end-result must be finally determined by the nature of the response of the organ to which it is carried. In its passage through the central nervous system the nerve impulse has a number of potential pathways opened up to it by the branching of the neurones over which it travels, and is therefore capable of passing by different routes and so giving rise to a variety of end-results. The pathways are not, however, equally open. The synapses between the neurones interpose different degrees of resistance to the passage of the nerve impulse. The synapses, therefore, are structures which regulate the number of neurones engaged. The factors which alter their resistance will be discussed at a later stage.

If the nerve impulse is to give rise to sensation it must be carried to some part of the higher level of the central nervous system which is associated with the reception and interpretation of that particular form of sensation. If it is to bring about a reflex it must be conveyed by efferent neurones to some effector organ. The separation of the impulses giving rise to sensation and reflexes can take place at various levels in the nervous system.

While the end-results of the nerve impulse in any neurone is mainly determined by the anatomical connexions of that neurone, it is also dependent upon the nature of the synapses or receptive substance the nerve impulse meets with at the ending of the neurone. The final efferent neurones of involuntary muscle carry nerve impulses which excite the contraction or inhibit the activity of the muscle according as the intermediate substance between the neurone and the muscle—the "receptive substance" of Langley, or "myoneural junction" of Elliott—is of an excitatory or inhibitory character. In the case of voluntary muscle the final efferent neurone ends only in excitatory material in the muscle, and the nerve impulses conducted to it always produce contraction of the muscle.

Voluntary muscle, however, is capable of being inhibited just as involuntary muscle is, and the process by which this is effected is similar in character though different in the site of its operation. In the case of voluntary muscle inhibition is exercised upon neurones in the lower level of the central nervous system, and the actual site appears to be in the synapse which intervenes between the last efferent neurone and the one immediately before it. Instead of the muscle being directly acted upon the inhibition is exercised upon the efferent neurone which supplies the muscle; in other words, the inhibitory substance is not in the muscle but in a synapse in the lower level of the central nervous system.

THE SYNAPSE.

We do not know the nature of the process which goes on in the synapse or even its exact anatomical structure, but many facts have been ascertained about the results it produces, and all point to its extreme importance. The synapse is irreciprocal and only allows the nerve impulse to pass through it in a forward direction. It does not conduct the nerve impulse as rapidly as does the neurone, and the passage of the impulse is always delayed there. The synapse interposes resistance, and a resistance which is capable of great variations in degree. A single stimulus of an afferent nerve sets up a nerve impulse which may fail to pass the synapse or synapses interposed on a reflex arc, even in a spinal animal, and it is only by repetition that the synapse becomes penetrable. The resistance of the synapse can be altered by a variety of circumstances. The repeated passage of a nerve impulse over it results in a lessened resistance, and the impulse then passes more readily. Repetition facilitates the passage of the nerve impulse over the synapses in any chain of neurones, and the effects may be more than temporary, so that one gets what is sometimes spoken of as "canalization." This implies that a path has become so "grooved" or deeply worn by frequent use that nerve impulses entering it tend to run in the same channels and produce the same end-results. As far as we know, such grooving of paths in the central nervous system is one, not of the neurones, but of the synapses which lie between them. The lowering of resistance occasioned by repetition of the nerve impulse through the synapses is of great importance. It is part of the normal process of education, and habits and skilled movements are thus acquired. Bad habits and abnormal ones may also be established by repetition, and the more frequently the nerve impulses pass through the same synapses the more difficult it becomes to re-educate the synapses, and to direct the nerve impulses into other pathways. This is true not only of the synapses on the pathways of nerve impulses bringing about reflexes, but also of those which carry nerve impulses giving rise to some forms of sensation. Conditions of hyperaesthesia and of hyperalgesia may be due to several causes. The receptors may undergo changes in adaptation and become more sensitive to stimulation, or the synapses may become less resistant in some part of the afferent paths, thus allowing the nerve impulses to pass more readily to the cerebral cortex. In conditions in which there is an increased irritability of the central nervous system the increased reaction appears to be due to a lessening of resistance in certain synapses; the response of the neurones is not altered in amount or in character but is more easily elicited.

The synapses may undergo alterations which modify not only their resistance but may completely change the nature of the influence the nerve impulse is capable of exerting upon the following neurone. Just as the receptive substance of muscle may be excitatory or inhibitory so the synapse may be excitatory or inhibitory. The synapse, however, differs from the receptive substance in that it can apparently alternate between the two phases and be excitatory or inhibitory as required. The inhibitory action exerted by the synapse appears to be more than a mere block to the passage of a nerve impulse, because it may prevent the neurone which it inhibits from being set into activity by other neurones. The nature of the alteration

taking place in the synapse is unknown. It appears to be brought into action automatically both by nerve impulses carried into the nervous system by afferent nerves, whether concerned with the production of reflexes or sensation, and by efferent impulses coming from the cerebral cortex and other higher levels. Possibly the refractory interval after each impulse may be the operating factor. However produced its effect may be compared with that of a system of water pipes in which there are numerous taps capable of being turned off or on so that the direction of the flow is regulated. The nerve impulse arriving by certain channels automatically controls the pathways taken so that the end-results are of a definite character. The pathways are more or less stable in the decerebrate animal, but in the intact nervous system can be altered by the control exercised by the higher levels. The pathway in the "unconditioned" reflex is accurately adjusted and is less liable to be interfered with by impulses from the higher levels, whereas the pathway for the conditioned reflex is readily changed by any of the numerous reactions to which the higher levels are subject. The power of inhibition is pre-eminently a function of the cerebral cortex, but its voluntary employment is limited to the inhibition of the efferent neurones which supply the voluntary muscles with nerve impulses causing their excitation. There is some evidence that the reception of nerve impulses which normally give rise to sensations, particularly of pain, can be interfered with in certain conditions, of which hysteria is an example. The explanation is probably to be found in an alteration in synapses somewhere along the chain of neurones which conveys the nerve impulses to the higher levels of the nervous system. The reflexes of involuntary muscle and of glandular secretions cannot be altered by volition, but may be increased or inhibited by emotional conditions. Tears, blushing, pallor, increased heart rate, and other visceral reflexes are examples of the kind.

The Action of Drugs and Toxins on the Synapses.

The synapse is readily affected by drugs and is far more susceptible to them than are the neurones. We expect, therefore, that when a drug is of sufficient strength in the body to alter the reactions of the nervous system it will do so by acting upon the synapse long before it can directly affect the neurone. There is evidence that the toxins produced by some micro-organisms also first exert their influence upon the synapse. Strychnine converts many of the synapses which should be inhibitory into excitatory ones; tetanus toxin has a similar effect. Under the influence of either of these poisons co-ordination of muscular movement becomes impossible because nerve impulses entering the lower level of the nervous system spread to all the efferent neurones of voluntary muscle and general convulsions follow. The toxin of hydrophobia also converts inhibition into excitation by its action upon certain synapses. In this condition a voluntary effort to open the mouth, instead of inhibiting the muscles which close the lower jaw, excites their contraction, and the more the patient tries to open the mouth the more firmly it is closed. Chloroform converts the excitatory phase of the synapse into an inhibitory one; ether and alcohol have similar though less powerful effects. These drugs show a selective action upon the central nervous system and pick out the synapses of different levels in a definite order. The synapses in the highest level are the first affected, and confusion of thought and judgement is manifested. Other synapses in the lower levels become involved with disturbance of the co-ordination of muscles, especially at first of those concerned with the finer movements such as facial expression and skilled actions. The reflex arcs of postural activity and locomotion are affected, and last of all the reflex arcs which have to do with the vital processes of respiration and cardiac action. Other drugs may affect the same synapses in different order, or may act upon the receptive substances which are analogous to the synapse. Atropine paralyses certain of the receptive substances at the endings of efferent neurones in the heart and in some glands. A small dose abolishes the conductivity of the receptive substance between the vagus nerve endings and the sino-auricular node, and the heart freed from the inhibitory action of the vagus, beats more rapidly. A similar action is exerted by atropine upon many glands, which as a result fail to receive excitatory impulses and cease to secrete. Larger doses of atropine impair the vasomotor control of the blood vessels, and delirium may result from the involvement of the synapses in the higher levels of the nervous system.

Nicotine is another poison which has a selective action in the first place upon certain synapses, and its local application to the ganglia on the autonomic nervous system has provided a valuable experimental method of ascertaining the sites of the synapses between the pre-ganglionic and post-ganglionic fibres. After painting the ganglion with a weak solution of nicotine the synapses are rendered incapable of conduction, whereas the neurones are unaffected. Nicotine, when injected into the blood vessels, stimulates the receptive substance of muscle so that the muscles go into a state of contraction. Curare has the reverse effect and paralyses the receptive substance of voluntary muscle so that the nerve impulse can no longer pass from the neurone into the muscle. Adrenaline, one of the autacoids of the body, exerts its action upon the receptive substance which lies between the endings of the sympathetic neurones and the organs they innervate. When injected into the blood vessels it stimulates these receptive substances, and the result depends upon the character of the receptive substance. If excitatory, as in the case of the vasomotor nerves of the blood vessels, the muscles contract and the arterioles are constricted and the blood pressure in the arteries rises. If inhibitory, as in the sympathetic supply to the greater part of the muscles of the alimentary canal, the muscles of the gut are relaxed and cease to contract while under its influence. Adrenaline furnishes an example of a chemical material which exerts a selective influence upon certain portions only of the nervous system. It picks out the receptive substances at the ends of the efferent sympathetic neurones, and affects no others than the sympathetic. Several substances of a like chemical nature to adrenaline have a similar action, and these drugs have been called by Dale "sympathomimetic," because on injection into the blood they bring about effects which resemble those produced by stimulation of the sympathetic nerves.

There is therefore abundant evidence that the action of drugs upon the nervous system is one which is exerted upon the synapses or upon the receptive substances between the endings of the efferent neurones and the organs they innervate. We know also that fatigue is brought about by the action of waste products formed during activity upon the same structures. There is also evidence that certain toxins have a like action. Different substances pick out the synapses of different parts of the nervous system, and spread to others in definite manner. The action may be first manifested upon the synapses in the highest level of the nervous system, as in the case of chloroform, and gradually spread to the lower level involving the synapses upon the pathways of the vital reflexes last of all; or it may begin in the receptive substances and cause death from paralysis of the muscles of respiration, as happens in poisoning by curare. It may gradually spread to the higher levels, as in atropine poisoning or in the continued use of overdoses of digitalis. We suggest that many of the manifestations of ill health are due to toxins acting upon different parts of the nervous system. The symptoms of botulism are explainable in this way, and their serious nature is due to the fact that the toxin involves the synapses upon the reflex arcs of the vital processes at an early stage. Other and more common conditions are the results of toxins acting upon less vital processes. Forms of exhaustion, nausea, lack of appetite, changes in temperature, cardiac, vasomotor and visceral disturbances may sometimes be ascribable to the action of toxins upon the synapses of the pathways which are concerned in regulating normal processes. Disturbances of the normal processes are to be recognized by the sensations experienced by the patient and by the alterations that take place in the reflexes, especially those of the viscera, cardiac, vascular, respiratory or alimentary.

It is imperative, therefore, that these effects, whether

subjective or objective, should be carefully recorded and analysed. Many of them appear to be common to a number of different conditions, but it is hoped that they will eventually be capable of classification, and thus provide the material for an early diagnosis of the conditions producing them.

THE TREATMENT OF GENERAL PARALYSIS BY INFECTION WITH MALARIA.

BY

W. McALISTER, M.A., M.B., CH.B.,

DEPUTY PHYSICIAN SUPERINTENDENT, ROYAL HOSPITAL AT MORNINGSIDE.

THIS paper is intended to give a preliminary account of an experiment in the treatment of general paralysis of the insane which has now been in progress for several months in the Royal Hospital at Morningside under the supervision of Professor George M. Robertson. Despite the fact that the etiology and the pathology of the disease—at least in their more significant details—have been successfully worked out, treatment has lagged far behind. Indeed, for the time being an impasse has been reached in the approach to the problem along the accustomed lines, and resort is being had to more empirical modes of treatment. Not that these are to be despised—if their fruits justify them, few will be found to cavil at their use.

In this latter category of reputed remedies one must place the treatment of general paralysis by inoculation with the plasmodium of malaria. The method has been used for a few years by Wagner von Jauregg in Vienna and by Weygandt in Hamburg, with results which, if confirmed, can hardly fail to arrest attention. It is claimed, for example, that out of a large number of patients treated in the course of twelve months no fewer than 41 per cent. can be regarded as completely cured; 20 per cent. sufficiently recovered to be able to resume their occupation though still retaining minor disabilities; and 10 per cent. as improved but not sufficiently so to warrant their discharge. The remainder failed to respond adequately to the treatment. The difference in the response to treatment seems to vary with the length of time the disease has been in progress before inoculation with malaria is resorted to. Thus, among the "cures" the duration was never more than two and a half years; among the "improved" the period was three and a half years; while in the case of the others the disease was of old standing. In practically every case, however, some improvement followed the treatment. In the most successful cases the physical signs of the disorder are said to have disappeared completely, though the laboratory findings—for example, the Wassermann reaction in the blood and cerebro-spinal fluid and the cell count and globulin content of the latter—remained unchanged. On the mental side there is reported a corresponding improvement. In other cases, though the results have been less satisfactory, there has apparently been some alleviation of the severity of the symptoms and a retardation of the rate of deterioration so characteristic of the disease. Such claims, confirmed as they were by the testimony of visitors to Wagner von Jauregg's clinic, seemed eminently worthy of practical investigation, and so the experiment was set in train.

Mode of Inoculation.

The first difficulty encountered at Morningside, when the experiment was resolved upon, was to procure a suitable supply of the virus. The help of the local health authorities was enlisted, but an exhaustive inquiry elicited the surprising fact that there was not at that time within the Edinburgh area an uncomplicated case of benign tertian malaria. The London School of Tropical Medicine was then approached, but even had a supply of the organism been available from that source, the practical difficulty of transporting it alive to Edinburgh was deemed insuperable. Just then there was admitted to Craig House from Burmah a young man whose mental breakdown was attributed to recurrent severe attacks of malaria, though no accurate information as to the type could be gathered. In due course this patient had a bout of fever which on clinical grounds appeared to be benign tertian malaria, and this was confirmed in the laboratory. As an additional precaution Colonel Marshall, Lecturer in Tropical Diseases in the University of Edinburgh, was called in consultation and confirmed the laboratory findings. But for this fortunate coincidence the initiation of the experiment might have been indefinitely postponed.

On March 29th of this year the patient referred to had a paroxysm, at the height of which venipuncture was performed and sufficient blood withdrawn in an ordinary syringe to inoculate twelve cases of general paralysis. Each of these received a subcutaneous injection of approximately 2 c.cm. of infected blood. The site of the injection was the loose skin just below the angle of the scapula. When the needle was inserted the subcutaneous tissues were probed in all directions to a distance of about 1½ inches so as to diffuse the plasmodium and promote absorption as rapidly as possible. A simple dressing of sterile gauze was affixed to the puncture by means of collodion, and any swelling resulting from the injection gently massaged. The patients immediately resumed their normal mode of life, but careful records were kept of their temperatures.

On reflection it would appear more prudent, in view of the difficulty of obtaining supplies of the virus, to substitute individual inoculation for the mass inoculation practised in this instance. In this way the virus can be kept alive for a long period of time by the inoculation of one patient from another in series. The one drawback would be that results would take longer to accumulate.

Incubation Period.

In every case the infection "took," though there were considerable variations in the length of the incubative period. The earliest cases had their first definite attack after eight days; a group followed the next day, and the others were spread out at irregular intervals till the sixteenth day. One case did not react till twenty-eight days had elapsed; while in another the interval was thirty-two days. Whenever a case was reported as having developed malaria a microscopic examination of the blood was made to confirm the diagnosis.

Subsequent Treatment.

The infection was allowed to run its course unimpeded for any number of paroxysms up to twelve—the average number being ten. During this time sponging was resorted to when required, but nothing more was done so long as the patient tolerated the condition well. In only two cases was it considered advisable to kill off the infection before the regulation number of paroxysms had occurred. In one of these an intercurrent affection occurred two days after the inoculation (and in no way dependent on it) and ended fatally, while in the other the decrepit condition of the patient before inoculation held out little hope that he would successfully carry the additional burden of a series of severe malarial attacks. He was therefore allowed to have only three paroxysms. To arrest the infection quinine hydrochloride was given in doses of 10 grains four-hourly for three days, and thereafter 5 grains thrice daily for fourteen days. In every case the temperature began to subside immediately after the administration of quinine was commenced, and by the fourth day was as a rule stabilized. In none of the cases has there been to date any recurrence of the malady.

The manifestations of malaria were in no way modified by its occurrence in cases already suffering from general paralysis, except that its discomfort was as a rule borne with forbearance which was as praiseworthy as it was unusual. On the fourth day after the subsidence of the temperature an intravenous injection of 0.3 gram novarsenobillon was given. This was repeated at weekly intervals for six weeks. There was generally a well marked degree of secondary anaemia after the infection had run its course, treatment for which was given simultaneously with the antispecific remedy.

Following is a brief account of the twelve cases treated:

CASE I.

An advanced case of general paralysis lasting for two and a half years. The patient died of peritonitis three days after inocula-

CASE II.

An advanced case lasting for three years, having previously had tabes dorsalis for three years. The patient was so infirm that only three paroxysms were allowed to develop. He did not seem to be affected by the treatment; decline was continuous thereafter, death occurring on May 30th, 1923.

CASE III.

Transferred to Bangour Hospital, where the infection "took." This case formed the starting-point of a similar experiment at Bangour.

CASE IV.

Duration of disease, eleven months.

Before Inoculation.—Mentally the patient was highly elated; had numerous tawdry delusions of grandeur—for example, could run 100 yards in six seconds; was imperial ruler of the universe; the greatest poet, preacher, and statesman in history. Facile and generally enfeebled; memory defective; frequently confused and disoriented. Physical state: Pupils unequal, right fixed; tongue and lower facial muscles tremulous; amimia; gait ataxic; other stigmata of general paralysis marked. Wassermann reaction in blood and cerebro-spinal fluid strongly positive.

Inoculation.—Incubation period, twenty-eight days; number of rigors, eight.

Present Condition.—Tolerated the treatment well, but was markedly anaemic at the end of it. Physical signs of general paralysis less obvious, but can be elicited on examination. Mentally is distinctly better. Is not now delusional and has a large measure of insight into his former state. His recent memory is now more dependable. There still remains a slight degree of euphoria and general mental enfeeblement, but the general improvement is striking.

CASE V.

Duration of disease, three and a half years.

Before Inoculation.—Mentally the patient was always dull and apathetic; habits faulty; distinctly enfeebled. Physically he was thin and enfeebled; pupils unequal and did not react to light; deep reflexes diminished; speech movements much impaired. Wassermann reaction in blood and cerebro-spinal fluid strongly positive.

Inoculation.—Incubation period, twelve days; number of rigors, nine.

Present Condition.—Tolerated the treatment well considering his condition. Highest temperature recorded 105°. Physical signs of general paralysis unchanged, but general condition better. Mentally there is little, if any, improvement.

CASE VI.

Duration of disease, one and a half years.

Before Inoculation.—Mentally the patient was stupid and mildly confused; had an exaggerated sense of well-being, with absurd delusions of grandeur, which, however, were beginning to fade before treatment; was silly in manner and speech; judgement obviously impaired and self-control diminished. Physically, he was fat and gross; pupils irregular, unequal, and unresponsive to light; marked impairment of speech—slurring and hesitant; great difficulty with test phrases.

Inoculation.—Incubation period, thirty-two days; number of rigors, eleven.

Present Condition.—Tolerated the treatment well, and improved under it. Had a severe degree of secondary anaemia from which he has now recovered. Trombone movement of tongue and difficulty in articulation not so prominent as before. Pupils now almost equal, and both react to light and accommodation. Physical health generally better. Expresses no delusions, but will concur in any imputation of great wealth, power, etc. His bearing as a whole is less aggressive.

CASE VII.

An early case; duration of disease, six months.

Before Inoculation.—Mentally, he was euphoric, lacking in common sense, full of impossible projects; deficient in self-control, especially when thwarted; there was slight impairment of recent memory. All these symptoms were present in a mild form. Physically, he presented all the characteristic signs—pupils very unequal and did not react to light; tremor of lips and tongue; failed at test phrases, etc. Wassermann reaction in blood and cerebro-spinal fluid positive.

Inoculation.—Incubation period, nine days; number of rigors, eleven.

Present Condition.—Devoid of insight into his condition, and intolerant of opposition to his whims. Always slightly elated. Physically much improved, and mentally has not lost any ground since inoculation.

CASE VIII.

Duration of disease, two years.

Before Inoculation.—The patient was silly and facile; memory much impaired; garrulous and incoherent; numerous grandiose delusions. Physically he was obese; musculature flabby; pupils unequally contracted and did not react to light; deep reflexes exaggerated; marked tremor of tongue and facial muscles; failed badly at test phrases. Wassermann reaction strongly positive in blood and cerebro-spinal fluid.

Inoculation.—Incubation period, nine days; number of rigors, nine.

Present Condition.—The patient is almost exactly as described above.

CASE IX.

Duration of disease, two years.

Before Inoculation.—Mentally, this case had advanced rapidly and had every appearance of terminal dementia. The patient could not be roused to answer questions except at rare intervals; his replies were almost unintelligible. Habits very faulty. So enfeebled in body and mind as to be practically bedridden. His physical state was comparable to his mental state. Had had numerous series of seizures, all of which produced further deterioration. Had lost weight progressively. All the stigmata of general paralysis prominent. Wassermann reaction in blood and cerebro-spinal fluid positive.

Inoculation.—Incubation period, nine days; number of rigors, eight.

Present Condition.—Distinctly improved physically, though the signs of general paralysis may still be elicited. Is rapidly making good his loss of weight. Mentally is very taciturn, but he now takes more interest in his surroundings. When induced to speak he shows a great improvement in articulation. Habits quite reformed.

CASE X.

Duration of disease, two years.

Before Inoculation.—Mentally the patient was stupid, amnesic, silly, and facile; had no definite delusions, but was unwarrantably happy and self-satisfied. Physical state: Pupils contracted and fixed to light; marked tremor of tongue and lower facial muscles; speech slurring; great difficulty with test phrases. Wassermann reaction positive in blood and cerebro-spinal fluid.

Inoculation.—Incubation period, eleven days; number of rigors, twelve.

Present Condition.—Less confused and does not obtrude his silly notions. Memory improved. Tidy in his habits and more active and alert. Speech difficulties remain quite marked. Pupils still unequal but react sluggishly to light.

CASE XI.

Duration of disease, four years.

Before Inoculation.—The patient was simple and demented; vaguely delusional; amnesic. Examination showed the deep reflexes to be exaggerated; pupils contracted and very sluggish in their reactions to light. There was tremor of lips and tongue; speech slurring. Wassermann reaction strongly positive in blood and cerebro-spinal fluid.

Inoculation.—Incubation period, eight days; number of rigors, twelve.

Present Condition.—Treatment has had a general bracing effect, both mentally and physically. Mental attitude more alert and responsive. Little change physically.

CASE XII.

Duration of disease, four years.

Before Inoculation.—Mentally the patient was facile, amnesic, and becoming progressively more demented; inert and indolent. Physical state: Pupils R. > L.; both irregular in outline and sluggish in reaction. Other signs of general paralysis well marked.

Inoculation.—Incubation period, nine days; number of rigors, eleven.

Present Condition.—No apparent alteration as the result of the treatment.

General Results.

In interpreting the results which have so far accrued it is of supreme importance to remember that time is of the essence of the experiment. The disease tends to run a course of something less than five years on the average, and its progress even when untreated is often interrupted by remissions of varying duration and completeness. Care is therefore necessary not to attribute to any given mode of treatment results which are possibly only incidents in the unfolding of the disease. Not until the diagnosis of general paralysis is placed on an unshakable foundation and the possibility of the "cure" being nothing more than a remission has been eliminated by the passage of time, can one be certain that this or that mode of treatment is a success. Quite recently, for example, a patient in Craig House, suffering from general paralysis, after an intensive course of antisyphilitic treatment had a remission lasting for fifteen months, during which he was able to resume the active management of a large legal business. In the end he relapsed and died of general paralysis. But of several others who had been similarly treated not one had the same experience—which goes to illustrate the old fallacy of arguing from *post hoc* to *propter hoc*. Similarly, from the very nature of the disease itself, it is obviously necessary at this stage to assay the results of the malarial experiment with equal caution.

Looking at the results as a whole, there is a complete absence of what, even when the term is generously interpreted, might be described as "cures." Such a result, keeping in mind the degenerative changes involved in general paralysis and the average duration of the disease in these cases, was hardly to be expected. Of the twelve cases originally inoculated two have since died, one of an intercurrent disorder and one of general paralysis. Another case has been transferred to a neighbouring hospital where the experiment is being continued. Of the remainder a well marked improvement has occurred in two cases. In one case (No. IX) the patient before inoculation showed

every sign that the malady was gaining the mastery. He appeared to be quite demented, and physically he was but a pitiable shadow of his former robust self. To-day he is to all outward appearance in excellent physical health. His habits are tidy; his speech movements, which were formerly almost wholly disorganized, are now well co-ordinated; and his vitality is not now drained by bouts of severe seizures as it previously was. Admitting, as one must do, that it is difficult owing to his taciturnity to assess the degree of mental enfeeblement which remains, yet one cannot but be struck by the general transformation. The other case is described above as No. IV. Here the conspicuous change is in the patient's mental state, though his physical health is also improved. To those who knew him in his former phase he now appears a new creature, a different personality altogether. In the remaining cases lesser, though often substantial, changes are common, but it is now generally recognized that many of these changes (for example, in the character of the pupillary reaction) may develop in the ordinary course of the disease. The average duration of the disease in the twelve cases was two years, and in every case the greatest care in the diagnosis was taken, all the usual serological tests being applied. At the moment these are again being investigated and so far as this has been done Wagner von Jauregg's conclusion that the condition of the blood serum and cerebro-spinal fluid is not materially altered by the malarial infection has been confirmed.

To the extent, at least, that none of the patients are any the worse for their experience, the experiment has been justified. Time alone will show whether any further justification will be forthcoming. Assuming that the results eventually turn out to be more favourable than they seem at the moment, how is the phenomenon to be explained? As long ago as 1883 Clouston described two cases in which mental disorders had been arrested by incidental sepsis, originating in one instance in the parotid gland and in the other in the hand. This led him to prophesy that "some day we shall hit upon a mode of producing a local inflammation or manageable septic blood poisoning, by which we shall cut short and cure attacks of mania"—the type of disorder from which his two patients suffered. The hypothesis underlying Wagner von Jauregg's work is virtually identical with that which Clouston here adumbrates, though it is applied to a very different form of mental disorder. Their common quest is for an infection which, while not of itself endangering the patient's life, will either stimulate the common bodily defences against the original disease or else will facilitate the operation of remedial agents. With this end in view some experimental work has been done with tuberculin and vaccines of different strains of staphylococcus. Apart from the risks involved in the use of these, the results from a therapeutic point of view have not been encouraging. Later still, attempts have been made to produce a more active bodily defence along some particular line without evoking the risks and discomfort of a general febrile disturbance. In this connexion some work has recently been done in Morningside with substances—for example, phlogetan—which produce a leucocytosis without the other accompaniments of fever. Here again, though a definite leucocytosis could be maintained for a prolonged period, the results of such treatment in cases of general paralysis were negligible. Whether the method of treatment with malaria will prove more efficacious time and a large field of experiment will be necessary to show. And even if the claims made for the treatment are in the long run substantiated there will remain to be answered many questions: Is the high temperature which can be produced incompatible with the well-being of the spirochaete? Has the infection with malaria any influence on the permeability to salvarsan of the choroid plexus? If the success of the method does not depend on such more or less mechanical effects, what subtle chemical changes occur? That these cannot be answered at the moment is enough to invest the further progress of the experiment with engrossing interest.

Conclusions.

1. Of the nine cases in whom the treatment was completed two are conspicuously improved; in one case the emphasis is on the mental, in the other on the physical improvement.

2. Besides these, four other cases show some improvement, although not so marked.

3. In the remaining three cases no distinct change has occurred. It is noteworthy, however, that in none of these cases has there been any progressive deterioration. This is specially true of the only early case—No. VII.

THE TREATMENT OF GENERAL PARALYSIS BY MALARIA.

BY

A. R. GRANT, M.B., Ch.B.Aberd.,

DEPUTY MEDICAL SUPERINTENDENT, COUNTY MENTAL HOSPITAL, WHITTINGHAM.

Wagner von Jauregg's[1] malaria treatment of general paresis, and the excellent results published by himself, Gertsmann,[2] Weygandt,[3] Kirschbaum, Delgado,[7] and others, first attracted our attention in the early months of 1922, and through the kindness of Professor Stephens of the Liverpool School of Tropical Medicine, who inoculated the first cases for us, we were able to commence this treatment in July, 1922.

Mosquitos are common at Whittingham, and recognizing the possibility of spreading malaria we had, prior to commencing treatment, examined many mosquitos caught within a mile of the hospital building, and felt satisfied that only varieties of Culex were present. In September of this year, however (fourteen months later), a further hunt for mosquitos revealed the presence of *Anopheles plumbeus*.

Whilst recognizing the impossibility of the restoration of degenerated cells and fibres we hoped for destruction of spirochaetes and complete and permanent arrest of degeneration. Authorities explain the influence of malaria upon the course of general paralysis in different ways. One is the destructive influence of high temperature as such on spirochaetes, as shown by Jahnel and Weichbrocht;[4] it is conceivable that waves of high temperature, as in malaria, may be more efficacious than continuous temperature. Muehlens and Kirschbaum[5] believe that following inoculation there is a marked impoverishment of the blood followed by a rapid regeneration of blood, which leads to a non-specific reactivation of the immunity processes. This theory would be supported by the views of Hauptmann. If these theories be correct, then high temperature and impoverishment of the blood should be aimed at.

It seems possible that different strains of *Plasmodium vivax* give different clinical types of malaria. Some authorities recognize only three species of malarial parasites, while others count double this number; it would appear that Muehlens and Kirschbaum were using a strain of *P. vivax* giving a different clinical type of malaria from ours, for in their experience of 76 cases artificial malaria jaundice occurred in 12 cases, whilst in our 40 only one case of jaundice has been observed.

It was with these considerations before us that, after inoculating cases with quartan, malignant tertian, and two strains of benign tertian, we decided to allow all strains to die out except the second strain of benign tertian, which we named "W." This strain from the first gave a reasonably high temperature and a marked degree of anaemia. It has produced no untoward effects, no local disturbance at the seat of injection, and no marked enlargement of the spleen. All cases have at once responded to quinine, and there have so far been no relapses. This strain has already passed through five hosts and is at present in use in other hospitals. It seems advisable to name the strain so that it may be traced, for many points, such as increase or weakening of the virulence of the parasite, and various other questions which arise, will be more easily answered when the strain has passed through many more hosts than at present.

It has been said that life in the invertebrate host increased whilst life in the vertebrate host decreased the virulence of the parasite, and again that the absence of true sexual reproduction would weaken the parasite, but we are of the opinion that the virulence of "W" strain is increasing. Temperatures now tend to higher levels than they did a year ago.

In our cases the blood for inoculation has, as a rule, been withdrawn from the host after allowing as many rigors as possible, often after ten rigors, our object being to use blood with as many parasites present as possible, and thus diminish the chances of the inoculation being unsuccessful. The parasites may become more attenuated the longer they are in the body, but on the other hand they may become more virulent owing to the fact that possibly only the fittest may survive.

In one case (No. 5) spontaneous recovery took place. In our experience the most noteworthy features of inoculated malaria are (1) entire absence of relapses, and (2) the promptitude with which the temperature subsides and parasites disappear from the blood on the administration of quinine. These features were pointed out by Wagner-Jauregg; in explanation he suggests that the parasites which reproduce themselves only in the asexual way are less capable of resistance.

In the first patient to be inoculated with the "W" strain, the blood was withdrawn from a patient in the Liverpool School of Tropical Medicine, and after being citrated was placed in a thermos flask which was kept as far as possible at body temperature. The time that elapsed between the taking of the blood and injecting it into the patient in this hospital was two and a half hours. The inoculation was successful. In another case citrated blood was sent from here to Liverpool, and patients were successfully inoculated. Ten days ago we sent some blood to Aberdeen, but at the time of writing the patient does not seem to have developed malaria.

The cases under review in this article were not specially selected; they were at very different stages of the disease, ranging from early to advanced, and showing psychoses of the most varied types. The ages ranged from 21 to 56 years, the former being a case of juvenile general paresis which exhibited some unusual features.[5] In all cases diagnosis was confirmed by the serological findings. Wassermann tests were made on the blood, and on the cerebro-spinal fluids Wassermann, Lange gold, and colloidal gamboge tests were made; in each case the cerebro-spinal fluid was examined for protein and a cell count was made. There has been no difficulty in obtaining the consent of relatives to this method of treatment.

The method of inoculation is as follows: From a vein of a patient who has received a malarial infection an amount of blood varying from 2 to 4 c.cm. was drawn, and about 2 c.cm. injected subcutaneously in the region of the shoulder-blade of the patient to be treated, the needle being moved about a little to cause a slight haemorrhage. In two cases blood was injected intravenously. If the patient to be inoculated could be brought into the same ward the blood was injected as it had been drawn. If this were not possible it was citrated. Blood films were examined in all cases at least once daily, in some others twice daily, and in others every two hours from rigor to rigor. These films have been preserved and may be further inquired into at any time. It has been our experience that once the parasites appeared they were present at all times and increased in number daily until the fever was controlled by quinine in the third week. In several of the cases the blood was taken during an interval free from fever, and from a practical point of view it seems immaterial whether the blood for injection is taken during a paroxysm or not. Where blood was citrated inoculation was as successful as where blood was injected as it was withdrawn.

As there was in our minds some doubt as to the effects of malaria on an already weakened constitution, and as we had not had previous experience of the prompt and permanent control of malaria by quinine in these cases, we selected four cases to ascertain if we could modify malaria in any way by giving quinine prophylactically. We gave quinine sulphate gr. x once daily for four days before inoculation and for four days after. In all four cases the patients failed to develop malaria.

Of 34 cases successfully inoculated with benign tertian it was noted that the first rise of temperature above normal took place on an average between the ninth and tenth days after inoculation. Parasites appeared between the twelfth and thirteenth days on an average. The earliest day on which parasites were found for the first time was the fifth day, and the latest on which parasites were found for the first time was the twentieth day.

The length of time we allowed to elapse between the finding of the parasites and the giving of quinine was largely determined by the physical state of the patient. General paralytics seem to stand malaria well. The high temperature does not seem to inconvenience them to the extent that might be expected. The number of paroxysms allowed was usually from eight to twelve, but the latter number has been exceeded on certain occasions.

It has already been said that one of the features is the promptitude with which the temperature subsides and the parasites disappear on the administration of quinine; there is usually no fever after the first dose, and in the majority of cases parasites are not found after the second or third day. During the past year we have not had a single relapse. This is contrary to what has been experienced in the treatment of malaria in the ordinary way, where the disease can be controlled but relapses are frequent. The absence of relapses may be accounted for by the absence of the intermediate host and consequently the absence of true sexual reproduction, or by the fact that the parasites may in some way acquire properties, or lose some of those they already had, during the time they are in the blood of a general paralytic.

While the cases inoculated with quartan malaria showed a fairly typical temperature chart, those inoculated with tertian malaria showed for the most part atypical charts; the general tendency in these tertian cases seems to be that while during the first few days of fever the charts may be fairly typical, in the later stages they become quotidian or irregular.

To cut short the malaria Wagner-Jauregg advises quinine bisulphate in doses of 0.5 gram twice daily for three days in succession and then 0.5 gram once daily for fourteen days—a total of 10 grams. Our first few cases were given quinine in total amounts varying from 32 to 48 grams, and in these cases the administration of quinine was continued for about two months, although the parasites disappeared from the blood in a day or two after treatment by quinine was begun. From Case IX onwards, however, we have found that a total of 2 grams of quinine sulphate daily for three days produces an equally good result.

In one case instead of quinine we gave 0.15 gram novarsenobenzol, and next day an examination of blood films did not reveal any parasites, although a few hours before the giving of the neosalvarsan there were on an average 51 per 100 microscope fields (1/12 inch). Concurrently with the quinine treatment weekly doses of novarsenobenzol, novarsenobillon, or silbersalvarsan have been given in 17 of the cases. Six doses have usually been given —0.3 gram, 0.4 gram, and four of 0.6 gram.

The following cases present features of unusual interest:

CASE I.

E. M., male, aged 37. Admitted July 11th, 1922.

History.—Patient served in the army during the war, and was discharged as unfit in November, 1916, after having been wounded in the head by a fragment of shell. He subsequently resumed civil employment and was able to work until May 9th, 1922, when he attracted the attention of his fellow workmen by an "emotional outburst." On admission he was mentally confused and unable to give a satisfactory account of himself. He was disorientated for time and place, and at times became lacrymose for no apparent reason.

On examination he was seen to be poorly nourished; weight 8 st. 12 lb. The cardio-vascular, respiratory, and genito-urinary systems were all normal. The right pupil was small and slightly irregular; consensual reflex present. Reaction to light brisk. The left pupil was dilated and irregular; consensual reflex sluggish; reaction to light very sluggish. Knee-jerks slightly increased and equal; plantars flexor; no sign of Rombergism. Superficial reflexes apparently normal. The blood gave a positive Wassermann reaction (1 in 5). The cerebro-spinal also gave a positive Wassermann reaction; the Lange gold test gave zone 1 curve; cell count 196; gamboge test precipitation in all five tubes; protein test positive.

He was inoculated with benign tertian on September 8th, 1922. During the attack of malaria and for some weeks afterwards his mental condition underwent a change. From being apathetic and lacrymose he developed well marked auditory and visual hallucinations, and also delusions of persecution, which for a time made him very troublesome with his food. Gertsmann refers to similar cases and seeks to explain the presence of the auditory hallucinations by the greater infiltration of the temporal lobes. The patient, however, made a good recovery and was discharged. He has since written a letter to his medical officer which shows that he has at present remarkably good insight.

On his discharge (June 30th, 1923) the following notes were made: *Nervous System.*—Pupils: right, slightly irregular, reactions (direct and consensual) to light sluggish; left, dilated, oval reactions to light, direct sluggish, consensual absent. All superficial reflexes equal and present; tongue, no tremors; speech, no impediment. Right knee-jerk diminished; left knee-jerk diminished; sensations normal, gait normal; Rombergism absent. Plantars flexor; sphincters normal. In good bodily condition. Cerebro-spinal fluid: Lange gold test, zone 2 curve; gamboge, precipitation in all five tubes; cell count 61; Wassermann test positive. Blood: Wassermann test positive 1 in 5.

CASE II.

J. A., male, aged 36. Admitted October 11th, 1922.

History.—Patient is unmarried. He is stated to have had ordinary health prior to being wounded in the head during the late war. He was, however, in the army until September, 1919, and was able to follow his employment until July, 1922, when he complained of severe headaches. No history of his having contracted syphilis has been given. On admission he was rambling and incoherent in conversation, disorientated, wet and dirty in habits. He usually lay in bed with his legs drawn up, and his face partially or wholly covered with blankets. He was in poor bodily health; unable to walk; his weight was 9 st. 4 lb.

On examination, the cardio-vascular and respiratory systems were normal. The pupils were small, unequal, irregular, and sluggish; tongue and lips tremulous; speech slurring; knee-jerks positive; plantars both flexor; showed intention tremors in hands. The blood and cerebro-spinal fluid both gave a positive Wassermann reaction; Lange gold test, zone 1 curve; gamboge test, precipitation in all five tubes; protein tests, positive; cell count 24.

He was inoculated with benign tertian on January 25th. At the end of March he was noted to have improved a little mentally—he was not so apathetic; there was also a slight improvement in his physical condition and he was just able to walk. In another month his condition improved both mentally and physically; he still remained wet and dirty in habits, but was able to walk a great deal better. By the end of June he was no longer wet and dirty in habits. His weight had increased by 2 st. and he was able to walk fairly well. At the time of writing he is in good bodily health, is able to walk fairly well, takes an interest in his surroundings, but his memory is very defective for recent and remote events.

CASE III.

J. W. B., male, aged 52. This patient contracted syphilis in 1906; he was diagnosed as a case of general paralysis in 1915 in another mental hospital, and was discharged presumably in a state of remission. He was admitted here in December, 1921. From the date of his admission until May, 1922, the disease did not seem to be making much progress so it was decided not to inoculate him with malaria. In the beginning of May, 1923, however, he had several seizures and his condition began to deteriorate rapidly. He became wet and dirty in habits, and eventually a bedsore developed. It was then decided to inoculate him with malaria. This was done on June 9th, and on June 20th he was put on quinine. Since that date he has improved steadily. He is up and able to walk about, the bedsore is practically healed, and his mental condition has improved a great deal.

CASE IV.

J. B., male, aged 54. On admission the patient was simple and childish; was completely disorientated for time and place. He was in feeble physical condition. Since March of this year he had been confined to bed and he was unable to walk. He had marked tremors of his hands and was unable to do anything for himself. He was inoculated on June 5th. He continued to improve rapidly after inoculation and is now able to walk about. He still has tremors of the right hand, but is able to work in the ward. His mental condition is much better; he is now orientated for time and place. The rapid amelioration of his mental and physical condition was commented on by his relatives.

CASE V.

R. B., male, aged 44. This patient made a spontaneous recovery from his attack of malaria. Parasites appeared in his blood nine days after inoculation; they remained in the blood for thirty-nine days, and then disappeared. He has had no rise of temperature since, nor have any parasites been found in his blood. A period of over three months has now elapsed.

Of the 40 cases under treatment during the past fourteen months, 6 have died. Three patients have been discharged to their homes and are now following their usual occupations. Three patients formerly wet and dirty in habits have ceased to be so. Two of the cases formerly confined to bed have regained their strength to a considerable degree and are able to be up and about.

We are of opinion that this form of treatment is worthy of an extended trial, as, in our experience, benefit seems to be obtained in almost every case. In 296 cases Gertsmann claims to have obtained a complete remission in 38 per cent. So far, we are not in a position to make a similar claim. Our idea in this article has been to record preliminary observations on the 40 cases under treatment in the hope that we may be able to refer to them at a later date.

It has been suggested that better results might be got from subjecting the patient to relapsing fever, a spirochaetal infection which produces a continuous fever for three or four days instead of an intermittent fever for a longer period. It is hoped that the antibodies produced will have an effect on the *Spirochaeta pallida*. We have, again, through the kindness of Professors Stephens and Yorke, been able to inoculate with relapsing fever, and we hope to be able to refer to this form of treatment again.

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THE CARE OF CHOREIC CHILDREN.

BY

A. DINGWALL FORDYCE, M.D., F.R.C.P.EDIN.,

HONORARY PHYSICIAN, ROYAL LIVERPOOL CHILDREN'S HOSPITAL.

THE overflowing nervous energy of healthy children exhibits itself in lively motor activity, which to the adult eye appears constant, and *may* be regarded as uncontrollable. The healthy child is nervous in the sense that his nervous system is comparatively unstable; but, granted moderate heredity and suitable hygiene and environment, he develops within the bounds of an ever-increasing power of control. Psycho-analysis and neurology must here be based on child-study and experience of children; knowledge of the characteristics of childhood is the essential basis for the interpretation of nervous phenomena. Much can be learned by close observation of emotional control, mental activity, and the neuro-muscular condition, but it is important not to exaggerate the significance of nervous symptoms. A marked form of expression of nervous instability is muscular spasm, and this spasm in some form is a common symptom in most illnesses. Its form of expression ranges from general restlessness to twitching of individual muscles, from violent convulsion to faint tremor.

DIAGNOSIS.

The "nervous" child oversteps the limit of self-control. The mild initial symptoms of "nervousness" are excessive motor and mental activity. Later, it may be noticed that, while the mental activity remains excessive, it becomes increasingly associated with emotionalism, and a lack of sustained or reserve motor power. The child is easily tired, he is irritable, he cries readily, and jumps at sudden sounds, etc. There may be motor lethargy, unwillingness and inability to play strenuous games. With further development of the condition emotionalism becomes more strongly marked, lack of reserve mental power and even mental peculiarity supervenes, and motor spasms occur. The cause of such a "nervous" condition is usually complex. Neurotic heredity is common, and, when present, is usually supplemented by neurotic environment. An extreme sense of responsibility on the part of the parents or guardians, or their ignorance or fear, often develops the unsuitable environment.

Frequently, however, the nervous element, whether in heredity or environment, is not primarily at fault. The common basal error in these cases is digestive. Irregular, improper, or excessive diet deranges digestion, and manifold sequelae result—among them nervous instability, diminution in the power of control, spasm. Endocrine function is sometimes, but rarely, markedly affected.

This "nervous" child is, further, exposed to the common hazards of childhood. In outstanding degree he is liable to suffer shock from the onset of puberty, from arresting and violent psychical stimuli, and from rheumatic infection

while, on the other hand, these factors in themselves may each suffice to produce a condition of "nervousness." In the case of rheumatic chorea the cause is demonstrably organic.

It is obviously desirable and very important that diagnosis should be exact as to the condition present, and as to the primary cause. The term "chorea," however, as generally used is a comprehensive one. Commonly associated symptoms are those already mentioned—namely, nervousness, lack of control, spasms—and with these frequently "turns," or "faints," or "fits," and mental peculiarity. A large proportion of such cases is diagnosed chorea. Under this term in addition to cases of Sydenham's chorea undoubtedly occur cases of excessive fidgetiness and cases of habit-spasm. Both these conditions are sometimes very hard to diagnose from true chorea. Sturges remarks that there is *no* sharp division between the movements of mild chorea and of excessive fidgetiness, and Still writes of some cases which he diagnosed as "? Chorea ? Habit-spasm." But with care and accuracy in examination such doubtful cases are very uncommon. The fact remains, however, that a considerable number of children suffering from excessive fidgetiness or from habit-spasm are designated choreic, and for present purposes I would include in one group (Group 1) children designated "choreic" and whose condition falls within the category of these three conditions.

There is, however, another, and though a very much smaller yet a very important, group of cases which occurs under the designation "chorea." In this minority group are cases of encephalitis, epilepsy, and mental defect (Group 2). In still other conditions choreiform movements may at first confuse, but the diagnosis should quickly be clear on careful observation. Such are cases of "cured" meningitis, of cerebral tumour, and of birth injury. An inco-ordinate peripheral paralysis may be mistaken for a paralytic chorea, but in such a case also a correct diagnosis should quickly be reached.

But in connexion with the conditions mentioned under Group 2 the difficulties in diagnosis are often much greater. The child who has suffered from encephalitis may lack a definite history of the original illness. These are "nervous" children who display abnormality of conduct, of the nature of excessive naughtiness of healthy children. There is obvious lack of nervous control, and sometimes tremor and rigidity. Alfaro[1] considers that, just as Sydenham's chorea is due to the virus of acute rheumatic infection, so there is a form of chorea due to the virus of encephalitis lethargica. It is too soon as yet to tell the possible degree of recovery in the mental condition of these children. There is, however, no doubt that re-education without strain and in healthy environment is essential, and the experience of teachers is, in many cases, hopeful.

In cases of children in which a suspicion of epilepsy arises accurate diagnosis is often of extreme difficulty. In some of these children convulsions occur only after emotional excitement; the children are "nervous" and excitable, and habit-spasms are common. In others the mental hebetude produced by epilepsy is very similar to that which often persists for long in the choreic child. History is particularly liable to be inexact in connexion with a condition such as epilepsy, and the fact remains that a small number of cases of epilepsy are at first labelled "nervous" or "chorea." Choreiform movements are common among mentally defective children. The important point in diagnosis is recognition that the "chorea" is merely a symptom occurring in a mentally defective child.

TREATMENT.

Cases of "nervous" children, when considered from the standpoint of the diagnosis of chorea, have hitherto been alluded to as falling mainly into two groups. The standpoint of "chorea" is assumed because, under this medical term of diagnosis, is ranged, in practice, a very large number of children displaying the symptoms of excessive nervousness, lack of control, and spasm. Chorea, in many instances, is either a faulty or an incomplete diagnosis. But it is here adopted as being the generic term under which, for lack of facilities and history, the condition of the seriously nervous child is often designated. Fuller opportunities for examination permit of accurate diagnosis in each individual case, and consequently mark more clearly the necessary line of treatment. It is from the point of view of institutional treatment that the two Groups 1 and 2 have been defined.

Twenty-five years ago Sir Robert Jones and Dr. C. J. Macalister were largely instrumental in founding the Country Hospital for Children at Heswall, which is now amalgamated with the Royal Liverpool Children's Hospital, Liverpool. The object of the hospital was the cure of children requiring prolonged treatment in the country, and within the hospital was developed a school. During the years that have elapsed since the foundation, the prevision of the founders has won widespread acceptation and recognition. Complete orthopaedic work under a master has revolutionized a branch of surgery, and has taught a lesson to physicians in their own sphere. The founders of the hospital recognized no less the potentialities here of medicine, in the directions both of prophylaxis and of therapeusis. A large number of the children admitted to the medical wards are cases of a nervous type, and falling within the category of "chorea" as here alluded to. The clinical material is rich and the types varied. Observation and study demonstrate striking points.

This communication is based primarily on a study of 317 cases. Of these, 53 were private cases seen in this area within recent years, and 141 were cases of old patients of the hospital—some of them patients so long as fifteen years ago—whom I have been enabled to follow up. For permission to investigate these latter cases I am indebted to the generosity of Dr. Macalister, and the valued assistance of members of the Child Welfare Association. The remaining 123 cases were recent hospital cases of my own.

My experience leads me to emphasize certain points, which seem to corroborate the validity of the present trend of care of these cases.

The first outstanding feature in the private cases is the importance of heredity. In 60 per cent. of these cases there was a marked neuropathic heredity. The next common feature was improper feeding and disturbed digestion; with this may be noted usually absence of sign of any marked endocrine dysfunction. Preceding and at the time of puberty these well-to-do children are the subjects of close attention and examination. The whole question of schooling is thoroughly investigated and arranged with studied care, and with a view to the later work of life. In some cases the wisest course is roughing it with his fellows, but in many others restrictions and special courses are necessary. This is particularly the period when moral neuroses may develop—not only sexual, but petty theft, causeless lying, etc. Whatever course is adopted, constant, wise, non-meddlesome observation is necessary.

How is it with the child of the hospital class? As regards immediate treatment, for this nervous "choreic" child, when of doubtful type, such a hospital as that at Heswall affords accommodation impossible to obtain in a hard-worked city hospital which has perforce to deal with acute cases. In the Country Hospital he is retained while an accurate diagnosis is made. The question then arises, Is he a suitable case for prolonged treatment, or is he occupying a bed which could be filled to better advantage? It is here that justification for Groups 1 and 2 appears, although there can be no absolutely fixed dividing line.

Members of Group 2 are, with few exceptions, unsuitable. On the other hand, members of Group 1 are most suitable as inmates for such a hospital, if on full examination hospital treatment is advisable at all. When an accurate diagnosis has been made, prolonged treatment here may bring about cure—otherwise almost impossible. In addition to ordinary medical and nursing care these patients require fresh country air, good plain food, mental and physical rest—it may be complete—and, along with this, individual attention as to the gradual restoration or development of the power of control, and a suitably attuned system of education. In the course of months, or it may be years, some of these patients are cured, and their hearts saved from lasting damage. Such cure may be permanent. But we are dealing with a class of case in which recurrence is common.

Certain points stand out prominently in the records. Chorea commonly recurs; it is not uncommon to meet with cases of recurrent chorea in which there is no other evidence of rheumatism and no cardiac lesion; but with recurrent chorea the heart is usually involved. In connexion with tuberculous infection the following points were noted: habit-spasm is common in the cases of children suffering from tuberculous lesions; chorea sometimes occurs after acute localized tuberculous infection or an operation for the same, and in such a case, so far as here noted, is non-rheumatic; tuberculous infection sometimes supervenes after true Sydenham's chorea with cardiac involvement.

But the most outstanding feature in the records is as regards home conditions. Many of these children relapse frequently, become weakly invalids, have little education, and find it hard if not impossible later to obtain any work for which they are fitted. On the other hand, those children, even when crippled by heart affection, who survive childhood with a modicum of education, with fair vitality, and who are able to work and find work suited to them, are those whose home conditions, though poor and often to the outside eye dismal, are described as good of their class.

Apart from actual lack of the necessaries of life and maternal overwork, lack of wisdom in the home is the common determining factor in the welfare of the child. Members of the Child Welfare Association do a great work in attempting to remedy this—a work ultimately of lasting educative value, and which deals with the problem at its root. But the day is yet far distant when the possibilities and wisdom in our poorer homes will prove a satisfactory or thoroughly responsive medium for even the wisest of health visitors. For the wisest of our well-to-do the problem is very difficult, and particularly so at the time of puberty and with the vista of life's work in view.

Our children's hospitals receive in their wards children till the age of puberty, and with the development of country hospitals such as Heswall suitable and picked cases may reach this age with possibilities otherwise unattainable of a useful active life. But at this most critical period adequate support suddenly fails. True, if the patient be sufficiently ill he will be admitted to a general hospital, or perhaps a convalescent home; but even there he is not graduating for a useful life. If he is merely weakly, there are large numbers of dispensaries or out-patient departments which he can attend, while living at home, and such medical supervision may suffice to give him a satisfactory introduction to adult life.

But many of the cases of the type of which I speak are of an intermediate group, for whom the latter routine is insufficient, and who, if subjected to it, inevitably sink in the physical scale, and for whom the prospect of life is unutterably dreary—if life itself is retained. For these, then, who need, and who are capable of usefully responding to, special environmental opportunity at this critical period, what possibility presents itself? Just as in the case of tuberculous infection medical care is incomplete without restoration to safe life in the sanatorium and colony, so in these cases medical effort is frustrated without supervision and direction during the years of puberty and adolescence. The "Trade School for Cardiacs" in America deals with such "occupational" or "follow-up" therapy. The children with whom we have dealt here are potential or early "cardiacs," and, from the commencement of their neuro-muscular symptoms, education in controlled movements is important. We need beyond, and in conjunction with, our Country Hospitals, Country Apprentice Schools in order to complete, and to justify from an economic point of view, our medical efforts and outlay for the children.

Dr. Poynton and Dr. Moon have both recently in this JOURNAL written cogently with regard to the need for wider and fuller methods for the prevention of heart disease and for the abatement of this scourge, the devastating nature of which is emphasized by Sir George Newman. The founders of the Royal Liverpool Children's Hospital at Heswall took a great step forward along this path, and pointed a finger towards the method for completing the execution of the basal theme of their conception.

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PROCEEDINGS OF SECTIONS AT THE ANNUAL MEETING, 1923.

SECTION OF MEDICINE.

Sir THOMAS J. HORDER, Bt., M.D., F.R.C.P., President.

DISCUSSION ON THE ETIOLOGY AND TREATMENT OF HEART DISEASE IN EARLY LIFE;

WITH SPECIAL REFERENCE TO THE PREVENTION OF CHRONIC CARDIAC INSUFFICIENCY.

OPENING PAPER

BY

REGINALD MILLER, M.D., F.R.C.P.,

Senior Physician to Out-patients, St. Mary's Hospital, and Physician to Paddington Green Children's Hospital, London.

THE honour of opening this discussion, of which I am very sensible, carries with it no small obligation, for there is no doubt that our subject—that of heart disease in early life—constitutes one of the major problems concerning the nation's health.

Directly we begin to think of this subject as a national question we find ourselves thinking in terms of one disease and one disease only, that of acute rheumatism—that great, essentially British, infective disease. Other diseases there are which will affect the hearts of children, and, of course, they are not ruled out of our discussion; but for practical purposes the problem of heart disease in early life is commensurate with the problem of rheumatic infection. It is to this subject that I shall confine my remarks, and for the purpose of our discussion I have somewhat painfully dissected out and labelled some of the various difficulties which keep us back from a more successful control of the disease.

PROGRESS MADE.

Before passing to these difficulties I think it might be of interest to express a personal opinion upon the progress made in the fight against this disease. The chief change in the last fifty years seems to be a reduction in the frequency of the severer manifestations of the disease. Taking all types, mild and severe alike, I suppose the frequency has declined a little; this is merely an impression, but the following considerations seem to prove the gradual reduction in the number of the severer types.

(a) Hyperpyrexia.—In 1882, to judge by the fifteenth volume of the *Transactions* of the Clinical Society, physicians would seem to have met with twenty, thirty, or even more cases in their own experience.* I doubt if anyone here has seen half a dozen. At Guy's Hospital, in the ten years 1900-1910 there was one case in 1,053 instances of "rheumatic fever." At St. Mary's Hospital in the last fifteen years I can recall two instances. The most dread of all rheumatic symptoms seems to be disappearing.

(b) Rheumatic Admissions.—The number of cases of rheumatism severe enough to require admission to hospital is also declining. Taking quinquennial periods from 1869 to 1914, the St. Bartholomew's Hospital reports show that the number of rheumatic cases per 100 medical in-patients has dropped from roughly 10 to 5. Instead of admitting something over 200 cases a year, there are now admitted something over 100.

(c) Acute Pericarditis.—The proportion of rheumatic in-patients who suffer from acute pericarditis perhaps gives us the most accurate idea of what is happening. The following table shows the percentage worked out in quinquennial periods (post-war figures are not yet available):

*In the five years 1873-77 at the Middlesex Hospital out of 778 cases of rheumatism there were 53 instances of hyperpyrexia (loc. cit., p. 253).

Quinquennia.	Acute Pericarditis per 100 rheumatic In-patients.
1870-74	13.57
1875-79	10.96
1880-84	12.07
1885-89	9.18
1890-94	13.18 (?)
1895-99	10.90
1900-04	9.53
1905-09	4.88
1910-14	5.09

(From *St. Bartholomew's Hospital Reports*, vols. viii-lii.)

The figures for the later years tally with those I have obtained from the St. Thomas's Hospital reports, which show about 5 per cent. of pericarditis in rheumatic in-patients. The Guy's Hospital figures (Sandison) for the decade 1900-1910 are 7.7 per cent. (St. Bartholomew's for the same period are 7.20).

I think, therefore, that there is small doubt that the incidence of acute pericarditis, the second most serious rheumatic manifestation, is falling. It would be interesting to know what is happening to the death rate from rheumatism, including rheumatic heart disease, in the country. Unfortunately the Registrar-General's returns do not permit of these figures being known with accuracy.*

Still we may at least say that some progress has been made, and it would seem probable that it is to clinical work rather than to public health administration that we attribute what improvement has occurred. It appears to affect the severity rather than the frequency of the disease, and this suggests that earlier diagnosis and more efficient treatment have been the factors responsible for the improvement.

Take what comfort we may from these considerations, there is not one of us here that is not profoundly dissatisfied with the rate of progress made, for rheumatism still remains one of the great serious infections of our land. What are the factors that tend to hinder us in dealing with this disease more successfully? They are numerous. We are hindered by lack of knowledge in some particulars, by lack of decision born of controversy in others, and (must I not add?) by a sensation of apathy due to familiarity with the disease. These are the matters we are to discuss to-day, and as they are so numerous, I venture to suggest that we might keep our thoughts the better in order by considering them under three headings, in each case referring to the problems of etiology and treatment:

1. The problem of the rheumatic infection.
2. The problem of heart disease in the rheumatic subject.
3. The problem of chronic cardiac insufficiency in rheumatic heart disease.

The Problem of the Rheumatic Infection.

As I have already said, the whole question of heart disease in early life is bound up in the problem of the rheumatic infection itself. This is the fundamental matter. I start with it, and I hope in our discussion we shall not shirk this, the most important question of all.

The modern view of rheumatism is that it is a special or specific bacteriaemic infection, working by repeated recrudescences and reinfections, and producing no sort of immunity against itself.

Perhaps the only point that I need refer to in this view is the claim that rheumatism is a "specific" infection. It is becoming increasingly difficult to define what we mean by this phrase, but I mean by it here neither more nor less than this—that the rheumatic infection produces a clinical condition so clear-cut and differentiated that it must be due (if an infection at all) to one type or strain of micro-organism. Bacteriologists often speak as though there were no true disease "rheumatism," but we cannot allow this. To see the infection at work in case after case, reproducing the same clinical picture again and again, is to be sure of our contention. Difficulties may arise in diagnosis from time to time: we may have to think of scarlatina, rheumatoid arthritis, malignant endocarditis, fibrositis, erythema nodosum, peliosis rheumatica (so called), yet in the centre, as it were, there is a clear-cut entity repeating itself in hundreds of cases, which is rheumatism. Not in more than one case out of a hundred is there any doubt, and to-day we are concerned with the ninety-nine. The researches into the histopathology of the disease so arduously conducted by Dr. Carey Coombs, while they prove the bacteriaemic character of the infection, amply support its specific or special nature.

I pass now to consider the main difficulties that have yet to be met in dealing with this disease.

1. *Rheumatic Environment.*

I do not think anything hampers us more than our lack of certain knowledge in connexion with the rheumatic environment. What is the link connecting rheumatism and poverty? Is there any truth in the traditional association of rheumatism with damp houses?

Shortly before the war I was able, by private arrangement, to trace many of the cases of rheumatism in Paddington. The housing conditions were reported to me, sometimes by amateur visitors, sometimes by the visitors working for Dr. Dudfield, the medical officer of health. There was a great uniformity in the reports as to the dampness of the houses; many cases came from *basements*, where we found wet walls, mildew under the oilcloth, even lack of concrete foundations,* and so forth. How these houses compared with others in the district I do not know, as the war put an end to my investigations; but when one has known, as I have, of three families occupying in succession the same basement, and the children of each in turn developing rheumatism, it makes one think that the housing must be of importance.

This is a public health question, and should be met by the appointment of some small committee of investigation. We do not need inquiry into thousands of cases, but a detailed investigation of the home circumstances of a hundred or so instances. Only severe cases, and preferably first attacks, should be included. These could easily be traced through hospitals, and it might, perhaps, be best for such an investigation to be undertaken in one of the bigger provincial cities, so as to keep the cases to a smaller area than London.

If we were sure of our facts and knew what we wanted to do, to make rheumatism notifiable might be of great service; but let us have the facts first and notification, if advisable, later.

2. *Education of the Public.*

We are hampered in our efforts to get hold of the rheumatic child as early as possible by the ignorance of the public, which still holds that rheumatism does not occur in childhood. To call attention to the dangerous frequency of the disease I should hesitate to suggest any great propaganda movement such as we have seen in connexion with tuberculosis, leading to such inordinate expense and such remarkably poor results. By going more steadily we can achieve much in these directions. The parents of rheumatic patients should receive careful instructions on the lines advocated by Dr. Poynton.[1] Elementary school teachers could help us much, but they will mistake tics for chorea. Might they not at long last be taught that a choreic child will grimace and squirm and fidget and make every con-

*Dr. R. Dudfield has kindly supplied me with the following figures from the Registrar-General's returns for the London area. They refer only to cases between the ages 5 to 15 years. They show the average annual mortality from (1) rheumatic fever, and (2) heart disease, and the mortality rate per 10,000 inhabitants. Triennia round the census years have been studied. The figures for heart disease include "pericarditis" and "endocarditis, valvular disease," but no exclusion of non-rheumatic cases is possible.

Triennia.	Rheumatic Fever.		Heart Disease.	
	Average Annual Mortality.	Average per 10,000 Population.	Average Annual Mortality.	Average per 10,000 Population.
1880-82	100	4.98	147	7.24
1890-92	110	5.03	167	7.39
1900-02	108	6.43	194	11.72
1910-12	83	4.00	213	10.08
1921-22 (2 years) ...	93	4.66	159	8.42

*See L.C.C. By-laws under Sec. 16 of the Metropolis Management and Building Acts Amendment Act, 1878, No. 23, October, 1891. Messrs. E. Stanford.

ceivable movement except "twitch"? They should learn that the early signs of chorea are exaggerated fidgetiness, inattention, stupidity, naughtiness, and emotionalism.

3. *Bacteriological Cause.*

The uncertainty which it is still the fashion to express on this matter hampers our clear conception of the disease. Has not the time arrived when we can agree that the infecting organism is an alimentary streptococcus? For my own part I regard this as well proven. I do not here intend to detail the evidence which has been brought forward by Poynton and Paine and many of their successors. In my own experience I have seen the streptococcus isolated by clinical bacteriologists who had been taught that it was impossible to find it; and I have been associated with experimental work and have noted its baffling alterations in virulence. One fact weighs enormously with me—that of obtaining the organism from the cerebro-spinal fluid in an occasional case of chorea. What can we think in such a case but that there is a causal connexion?

That the streptococcus cannot be separated from certain types of alimentary streptococci is not, to my mind, against this view; on clinical grounds nothing is more likely than that the rheumatic agent is a constant inhabitant of the alimentary tract. I feel that, after all the years that have elapsed, we might now agree that in the theory of the causation of rheumatism by an alimentary streptococcus we have a complicated key which fits a complicated lock.

4. *Salicylate Therapy.*

Our treatment of rheumatism must suffer if we cannot decide what action salicylate has upon the disease. This is another long-standing controversy: does salicylate act by diminishing the activity of the rheumatic infection? I see no escape from the conclusion that it does. To deny any bactericidal action to this drug in rheumatism is to be left without any explanation of its curative action in acute rheumatic arthritis. I suggest that the explanation of the action of salicylate in rheumatism is as follows.[2] In this infection we have three sets of tissue changes set up. First, we have focal interstitial inflammatory lesions, the direct result of the infecting organism. These are the chief changes seen in acute arthritis, acute tonsillitis, and in acute pericarditis where it exists without much myocardial damage. These are well controlled by salicylate, and we may say that where the patient's symptoms are due to this type of lesion the clinical result of salicylate therapy is satisfactory. But, secondly, we have toxic parenchymatous changes often affecting the "noble tissues" of the heart muscle and brain. No bactericidal drug could here do more than prevent further damage by putting an end to the infection. Therefore, where the patient's symptoms are due to such changes as these, salicylate acts at a disadvantage, although it still does some good. In this category come myocarditis and chorea. The large effusions sometimes left in joints when the pain and fever have disappeared, rheumatic anaemia, and nodules are (clinically) in a somewhat similar position. All these are results of an infection and will persist although the infective activity has ceased. Lastly, there are the changes induced by healing processes, which, of course, salicylate cannot touch.

With such an explanation as this we feel that we can use salicylate with freedom. The effective dose in children is from 60 to 120 grains a day, and in practice it is most important that the daily dose should be divided up into many small doses, rather than given in a few large ones. It must be remembered that it is the patients with much cardiac dilatation who are apt to vomit with salicylate; however carefully it may be given, about 30 per cent. of such cases tolerate it badly.[3]

I come now to two clinical difficulties which have a very real bearing on the prevention of chronic cardiac insufficiency, but I deal with them now as they are connected with the infection itself. I hope to receive much help from our discussion on these two questions.

5. *Source of Recrudescences and Relapses.*

The first of these concerns the origin of the renewals of activity on the part of the infection. I suppose we should all agree that early attacks may often be traced to tonsil infections, and I think where only early attacks are co sidered the removal of the tonsils may do permanent go But it is now generally recognized that where there ha been repeated attacks tonsillectomy often fails to preve further trouble. Whence come these later attacks? Ar they from the alimentary tract, the mouth, or the bowel or do they originate from foci left encapsuled in th tissues of the body? In some cases it would seem tha they are not really fresh attacks but recrudescences of a infection which has never truly been quiescent. I confes that this whole subject, important though it is, is full of mystery to me.

6. *Test of "Cure."*

Another very difficult clinical point concerns our appre ciation of the time when rheumatic activity can be sai to be at an end. I think it most difficult to be sur of this. Personally, I attempt to judge by three tests first, the loss of the toxic appearance of the patient second, gain of weight; and third, the temperature. O the three I lay most stress on the child's appearance. Th temperature chart is not an easy guide. A really "flat chart, I think, may safely be regarded as meaning a absence of infective activity, but one showing irregularitie I regard as uncertain; while any regular swinging of th temperature, whether it swings above the normal or (a so often in chorea) keeps entirely below the normal line I regard as meaning some remaining rheumatic activity. With the greatest care, however, I find it hard to judg between an infection really quiescent and one which i smouldering on in a low state of activity.

Problem of Heart Disease in Rheumatic Subjects.

I come now to speak of the causation and treatment o heart disease in patients who are already infected wit rheumatism. Heart disease in rheumatism is largely a matter of the severity of the infection and the age of th child. It is a well recognized rule—although chorea wi sometimes furnish exceptions to it—that we do not find acute rheumatism of the "adult" type (in which the heart tends to be spared though the infection be severe) under the age of 10 or 12 years. Below this age, and often above it, rheumatism is essentially an infection of the heart.

I leave for the moment cases of the type which goes on to chronic cardiac crippling, and speak here only of the commoner type, in which the heart, although showing signs of damage, seems to recover its functioning power satisfactorily. In such cases the heart has nearly always been damaged before the child comes under treatment, and in my experience, if the heart has escaped, it will remain free from damage in most instances once the child is admitted to hospital. Therefore, so far as these cases are concerned, our principles of treatment consist chiefly of (1) early diagnosis and (2) efficient treatment for the infection.

1. *Early Diagnosis.*—I would like here to emphasize the fact that although often the severe symptoms of rheumatism develop with a rush, yet they have nearly always been preceded by mild symptoms which have been neglected or misinterpreted. It is during this stage of invasion that we want to get their child under antirheumatic treatment.

2. *Efficient Treatment.*—Our aim here must be to subdue the activity of the infection by salicylate while sparing the heart as much as possible by resting the patient. These two measures are the best preventives of cardiac rheumatism. I do not know of anything else that can be done to prevent the heart's being involved, or to put an end to carditis should it exist, with the exception of the use of counter-irritants to the precordium in cases of acute pericarditis. In the cases I am here considering these measures are usually successful.

Problem of Cardiac Crippling in Rheumatic Heart Disease.

The last problem I have to consider is that of the chronic heart invalid: the type of case which has great enlargement of the heart, with mitral disease and often aortic

regurgitation or pericardial adhesions, but of which the most characteristic feature is the greatly diminished power of recovery in the heart muscle.

How do such cases arise? The first and most obvious thought is that they are our failures—the infection has beaten us. This brings me to the first question for discussion: Is it infection or mechanical strain that has done the harm? I believe it is infection rather than exertion every time. Lack of rest may predispose to further cardiac infection, but the heart of a child never breaks down by mechanical strain alone; always there is reinfection. Therefore we must look upon these cases of chronic heart crippling as the result of repeated infections. Herein lies the importance of the problem I have already emphasized—the source of these recrudescences and reinfections.

In the face of such difficulties what can be done in the way of preventing and treating chronic cardiac insufficiency?

1. *Salicylate Therapy.*—Once the heart is hopelessly damaged and the patient in a condition of chronic rheumatic toxaemia the action of salicylate is, as I have already said, disappointing. Nevertheless I believe it to be true that the more freely and persistently we use salicylate in the earlier rheumatic attacks, the less often shall we be faced with these dreadful failures. My own practice in these chronic toxic cases is to continue small doses (60 grains daily) in the hope of preventing fresh activity on the part of the infection, and to give double that dose for a few days at a time if the temperature appears to be mounting. I am aware that it is said that to persist in the use of the drug is to render it inoperative, but when I recall all the antisalicylate views that have been expressed in the past, I do not feel called upon to regard this statement as necessarily true. For my own part I believe that, although the persistent use of salicylate helps but little in getting rid of the last symptoms of rheumatic activity, yet it does help to prevent recrudescences of that activity. I feel the responsibility of omitting salicylate is far greater than that of ordering it.

2. *Cardiac Drugs.*—Drugs of the digitalis group play but a small part in connexion with the heart disease of young people. In the presence of active rheumatic carditis they are of no avail; in its absence they are seldom indicated. Occasionally they may be beneficial, used on the same lines as in the heart disease of older people.

3. *Vaccine Therapy.*—In spite of recent reports with *S. viridans* from America I cannot think that this line of treatment is very hopeful. It has been extensively tried in this country, and even at the time when vaccine therapy was so much more fashionable than it now is, the reports were conflicting and mainly disappointing. The reasons are not far to seek. The chronic cases, such as we are now considering, are for the most part far too toxic and too ill to react to inoculation treatment. But even used as a prophylactic, is it likely to be of value? I think not, for if we know anything about the rheumatic infecting organism it is that it fails to produce in the human subject any immunity against itself.

4. *Tonsillectomy.*—In the earlier attacks of rheumatism with carditis I believe tonsillectomy to be the correct treatment where the tonsils are obviously diseased, and I do not hesitate, if the condition of the heart permits, to recommend operation where the temperature refuses to settle down. I have never had cause to regret such a decision, although on theoretical grounds it would seem possibly dangerous; on the contrary, the results are often extremely gratifying, the temperature showing a quick return to the normal. In later cases, where the toxicity is extreme and persistent, there is seldom a chance of removing the tonsils owing to the condition of the heart. I have already said that tonsillectomy at this late stage often fails to prevent recrudescences and reinfections.

5. *Other Measures.*—Recently I have tried to reduce the toxaemia in these patients by means of Plombières douches given twice a week. Such treatment can only be applied to patients who are already on the mend, and so far I have seen it do neither good nor harm. Whether Professor Wright's new method of transfusion with immunized blood will give us assistance in getting rid of smouldering rheumatic infection I cannot say, as I have had no experience of it in this condition. I think it might be well worth a trial, as I feel it might turn the scale in the patient's favour.

6. *Régime.*—At the present time the best that seems available for these cardiac cripples is prolonged treatment under a régime partly that of a hospital and partly of a convalescent home. There are some here to-day who have given much time and thought to this subject, and I look to them to tell us of their experiences in our discussion. I shall not do more than try to sketch the principles of the treatment and to enumerate the various alternatives before us.

The one great object which we have in view is to prevent fresh rheumatic activity. In the absence of this the heart will gradually right itself as far as the previous damage done to it will permit. As regards rest, I think most of us will agree that prolonged and strict rest is neither necessary nor advisable. The essentials of this line of treatment would therefore seem to be: (*a*) prolonged quiet rather than strict rest; (*b*) correct hygiene; (*c*) close medical observation and opportunities for strict treatment if necessary; (*d*) some facilities for education.

The possible ways by which such treatment can be carried out for long periods are not very many:

Hospitals.—The pressure on hospital beds renders this an impossible scheme even were it practicable on other grounds.

Ordinary Convalescent Homes.—Even were these ready to take heart cases we could not recommend for this purpose these homes as at present run. The ordinary convalescent home in the country or at the seaside is too happy and lively a place for the chronic heart case. I think most physicians have quite given up sending such cases to convalescent homes even where they will be accepted.

Hospital Convalescent Homes.—Many children's hospitals finance and manage their own convalescent homes and there these cases do well. The children are admitted with full instructions for treatment, they are visited by those who have seen them when at their worst, and the parent hospital is ever ready to readmit the case should necessity arise. The length of the patient's stay sometimes puts a strain on the management of the home, but on the whole this is a satisfactory arrangement except for the lack of educational facilities.

Special Heart Homes.—In many ways special homes would constitute the ideal way of treating these cases, and I am glad to say that at last some such homes have been opened and more are in the process of being planned. Such homes should be within touch of the hospitals, and I fear that there is no doubt that every large city could fill a home of this sort. Difficulties seem to have arisen concerning the provision of educational facilities, but these should not be insuperable. The chief disadvantages of this scheme of providing special homes for heart cases would seem to be that they must always be costly to run if no other cases are admitted, and the long delay before the supply of such homes can be adequate. It has taken more than ten years, to my personal knowledge, to get the homes now available; and I am not without hope that we shall be able to prevent these cases more quickly than we shall be able to provide for them at the present rate of progress.

Special Beds in Convalescent Homes and Country Hospitals.—I think much might be done, and without undue delay, by the setting aside of special beds in the existing convalescent homes and country hospitals. It has been suggested that chronic heart cases might well be taken in conjunction with surgical cases of tuberculosis. In both groups there is the same need for prolonged treatment and much rest and for a certain amount of education at the same time. If the governing bodies would be content to allow amateur teaching for these children instead of wasting time in endeavouring to extract education grants from the Government, the difficulty in this matter would soon disappear. There would, I am sure, be no great difficulty in getting such teaching done, any more than there would be in finding doctors keen to undertake the

medical supervision of these children. It would seem to me to be work admirably adapted to the inclinations and capacity of some of the religious sisterhoods of this country, and I am hoping to hear how the experiment has gone at St. Mary's, Broadstairs.

I think that it is along these lines that we could make the quickest advance and arrange for the treatment of these cases without much longer delay.

CONCLUSIONS.

I have now sketched out to you the problems of the great rheumatic disease as they appear to me at this time, and I have done my best to point out more particularly those factors which seem to me to be preventing us from coping more successfully with this disease of our country. I conclude by specifying the most urgent and important of the problems awaiting solution:

1. What is the underlying connexion between rheumatism and poverty? This I believe to be by far the most important question not yet certainly solved.
2. What is the origin of the repeated relapses and reinfections in the rheumatic state, and how can they be prevented?
3. How can we be enabled to give long courses of treatment to our many heart cripples in the hope of prolonging their lives?

It will be seen that these problems concern alike public health workers, clinical physicians, and that never failing friend of our profession—the charitable public.

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[1] BRITISH MEDICAL JOURNAL, 1923, i, p. 920. [2] Miller, R.: The Scope of Salicylate in the Treatment of Acute Rheumatism, *Clin. Journ.*, June 4th, 1913. [3] Miller, R.: The "Specific" Use of Salicylate in Acute Rheumatism, *Quart. Journ. Med.*, 1912-13, vi, S. 19.

DISCUSSION.

Dr. G. A. ALLAN (Glasgow) said that Dr. Miller had taken a wide survey of the subject and had outlined various avenues of attack against this most important branch of the problem of heart disease, and Dr. Allan was glad to find himself in general agreement with the attitude he had adopted. The object that was before the meeting was the prevention of that type of cardiac insufficiency which had its origin in the early years of life, and their attention was thus naturally directed in the first place to a consideration of acute rheumatism and its allies. The opener of the discussion had pictured for them the progress that had been made during the past fifty years in dealing with rheumatism and its cardiac effects, but it was a progress which, as he said, left rheumatism still one of the great serious infections of this country. The speaker wished to emphasize the magnitude of the problem that still confronted them. The returns of the Registrar-General were not sufficiently detailed to give accurate figures, but he found that in 1921, 53,710 deaths, or 11.7 per cent. of deaths at all ages and from all causes in England and Wales, were due to heart disease, and this did not include disease of the blood vessels. Tuberculosis and cancer, on account of which so much money was annually expended, appeared on the returns with about 10,000 less to their account. Many factors accounted for these stupendous figures, and not all of them were before them that morning, but they knew that rheumatism was one of the most potent single factors, and accounted for about one-half to one-third of the deaths due to heart disease in the wards of a general hospital. American figures were in close agreement with these, and in that country 11 per cent. of the total deaths were noted as being due to heart disease.

They could visualize the problem in another way by making use of the results of the medical inspection of school children. In Dr. Allan's own city of Glasgow, with a population of 1,111,428, the education authority was responsible for 198,304 children, and of those subjected to routine examination last year 0.6 per cent. had organic heart disease of the acquired variety, and 1.1 per cent. had functional heart disorder. In *The Health of the School Child*, which was the 1921 report of the Chief Medical Officer of the Board of Education, Sir George Newman stated that in the routine examination of school children in England and Wales about 0.7 per cent. were found to have organic heart disease, and 0.8 per cent. had functional heart trouble, while in London, at the age of 12, 3 per cent. of the boys and 4 per cent. of the girls had "heart defects"—a term that probably included the functional cases. In other words, taking the smaller percentages, there must be in Great Britain between 45,000 and 50,000 children of school age who had organic heart disease, many of whom were destined to become cardiac cripples before middle life. An interesting point emerged from some figures supplied to Dr. Allan by Dr. Bruce, one of the school medical officers in Glasgow. In the 5- and 6-year groups of school children, 0.5 per cent. had organic heart disease; in the 13- and 14-year group 1 per cent. had heart disease. The percentage had doubled during the compulsory school period.

Dr. Allan declared that Dr. Miller had rightly put in the forefront of his paper the consideration of rheumatism as rheumatism. The control or prevention of acute rheumatism and its allies was the basic problem. Next there had to be considered the treatment of the child who had had rheumatism, chorea, or repeated tonsillitis, but who had yet had no cardiac lesion—the potential cardiac case. Lastly, there was the case of the child who had some cardiac lesion, but who was not yet in the category of chronic cardiac insufficiency. Any child beyond that stage did not at present come before them for consideration.

If possible, some agreement about the infecting agent was wanted—but an organism did not necessarily have to be seen before it could be fought. If they knew where it was entrenched they might be able to deal with it. What was the relation of tonsillitis to rheumatism? Was it simply in certain types one of the rheumatic manifestations, or was the tonsil the port of entry or the home of the organism? What was the relation of scarlet fever to heart disease? Did scarlet fever produce endocarditis, or did the rheumatic organism simply gain entrance through the diseased tonsil in that disease, and so produce arthritis and endocarditis? If some of these questions could be definitely settled it would obviate the necessity for some of the discussion regarding enucleation of tonsils in rheumatism. The subject of chorea could not be slipped in casually with rheumatism; it demanded separate and special consideration. Further, they did not know the conditions that predisposed to the rheumatic invasion. Dr. Miller called for an inquiry into the connexion between rheumatism and poverty. That was important, but it would not necessarily give all the information they wanted as to the predisposing factors. The whole question of predisposing factors should be the subject of systematic inquiry. Apart from all these questions to be solved they could even at present, do something by education. In a letter from the author of the figures he had quoted there occurred the remark, "Parents do not realize that it is possible for children to have rheumatism." Parents could be made alive to certain aspects of the subject that might ensure earlier medical attention. Medical students should be made to realize the essential difference between rheumatism in the child and in the adult, and they and medical practitioners should be made to recognize that pharmacopoeial doses of salicylates, three times a day until fever disappeared, was frequently only playing with a serious disease.

The second class that should receive special mention was the child who had suffered from rheumatism, chorea, or repeated tonsillitis, but in whom the heart was not yet affected. The end-results that were met with in hospital or in private practice were not commonly the result of a single attack of rheumatism. Cases of pancarditis with a first attack did not as a rule live long. Could anything be done to prevent subsequent heart involvement, to prevent, that was, the recrudescence or reinfection? Dr. Allan referred to some work that had been done in this connexion under the auspices of the Association for the Prevention and Relief of Heart Disease of New York. A small series of 65 cases of potential heart disease had been followed and cared for over an average period of four and a half years; 24 had had rheumatic fever or growing pains

or repeated sore throats, and of these no case developed heart disease when under observation and care; 41 had had chorea, either alone or with acute rheumatism, and 16, or 39 per cent., developed heart lesions. In children a rheumatic history was obtained in a majority of cases of heart disease, and as in no one of these 24 rheumatic cases did heart lesions arise when they were cared for, it would appear that prevention had been secured. But the care of the child with a nervous manifestation of the disease—namely, chorea—was found to be much more difficult to control. That was a clearly defined part of the problem. Through school examination these cases could be located. It would appear that some good could be done to them, and no doubt much useful information could be gained regarding the natural history of the disease by systematic investigation. The Chief Medical Officer of the Board recognized this, and had recommended examination, re-examination, and special school where necessary.

The third group, the slightly affected child, presented the same problem—namely, the prevention of reinfection or recrudescence of the disease. Dr. Allan did not propose to go into details of method; more information on many points was wanted, much of which was no doubt available if the facts of many workers could be collected and sifted. They wanted to know definitely the habitat of the organism. They wanted to know the factors that predisposed to the disease. And then they might, by suitable treatment and by providing a suitable environment—be it in convalescent hospital or open-air school—do something to lessen the incidence of the disease. Dr. Miller had suggested that any progress in the past might be ascribed to clinical rather than to administrative methods, but Dr. Allan felt that the progress might have been much more rapid if, instead of isolated clinical observation, some concerted action had been taken by workers in different parts of the country. To get the full benefit of work on such a subject there should be a clearing house where information could be received, correlated, sifted, and discussed. A committee or association linking up various workers would be in a position to influence medical and lay opinion in the direction of most useful activity. New York had already done much of the spade work in that direction, and with so much success that its association was likely in the near future to become a national body. Dr. Allan believed the time was ripe for some such definite movement in this country. A recent paper by Dr. Poynton in the BRITISH MEDICAL JOURNAL had brought forward correspondence which showed an awakened interest in the subject, and a discussion on the same lines at a recent meeting of physicians was marked by remarkable unanimity.

Dr. Allan proposed: "That the Council of the Association be recommended to appoint a special committee to consider the best steps to be taken to combat the grave menace to the community arising from chronic cardiac disease." This recommendation was seconded by Dr. REGINALD MILLER and supported by Dr. CAREY COOMBS, and was carried unanimously.

Dr. J. G. EMANUEL (Birmingham) said that in young people they recognized that not only was rheumatism the all-important cause of heart disease, but that in a child who was suffering from organic heart disease, albeit well compensated, the danger to this child in the future was not over-exertion but reinfection. When a *post-mortem* examination was made on a child who had died from heart disease evidence was invariably found of recent endocarditis, myocarditis, or pericarditis. In children they did not have to contend, as in adults, with long-continued high blood pressure, progressive myocardial degeneration, progressive coronary artery disease, new rhythms like auricular fibrillation, or prolonged physical and mental strain. These might be causes of cardiac failure in adults; they were not so in children. In children, the danger they had to fight was rheumatic reinfection and perhaps the greatest difficulty in practice was the recognition of the presence of active infection of the endocardium or myocardium. The presence or absence of infection was the guiding principle of treatment, for the damaged heart required rest in bed if infection was going on, it required exercise if there was no active infection. Exercise was just as necessary for keeping efficient a damaged heart as it was for keeping the normal heart efficient, but exercises must not be commenced until all active infection was over.

When they had under their care a child suffering from subacute rheumatism, it was very difficult to say whether active infection of the myocardium or endocardium was present, that was to say, whether the patient might leave bed and begin some form of graduated exercise. The physical signs determined by auscultation and percussion would not help them. Alteration in the size of the heart, the presence of murmurs, modification in the heart sounds or in their spacing, *x*-ray or electrocardiograph examinations would not determine the presence or absence of active infection. Abnormal cardiac physical signs were evidence of anatomical changes, often compulsory, that followed infection, and they might be entirely absent when serious infection was present. There was one exception to this general statement afforded by pericardial friction. That meant pericarditis, and pericarditis meant more or less myocarditis and frequently endocarditis.

The signs of infection in active rheumatic carditis were similar to those in other infective diseases—for example, pulmonary tuberculosis. In a case of phthisis they did not gauge active tuberculosis by alteration in the percussion note or in the breath sounds, but by such signs as pyrexia, loss of weight, and anaemia. They should look for similar signs in cases of rheumatic carditis; but rheumatic carditis often ran an apyrexial course—even in infective endocarditis pyrexia might be absent for weeks together. In carditis anaemia was often too slight to be a guide, and in any case might be due to other conditions, and the same held for loss of weight. Dr. Emanuel believed that the pulse rate afforded the surest indication of active infection of the heart. A quick pulse, 100 or more when the patient was at rest in bed, indicated a carditis demanding continued rest. If infection was at an end the pulse would resume a normal rate. The reaction of such a pulse rate to digitalis afforded further information as to infection. For, if the heart was beating rapidly because it was being excited by the rheumatic toxin, digitalis would not slow the rate. The same thing was seen in pulmonary tuberculosis, pneumonia, and Graves's disease. So long as the heart muscle was stimulated by the tuberculous, pneumococcic, or thyro-toxin, digitalis would not slow the heart. So, for instance, in a convalescent case of chorea still in bed, if the pulse was high and the rate was unaffected by digitalis, he would regard this as evidence that there was active infection of the heart. If, however, digitalis slowed the pulse, he would conclude that all active infection was over. The question of a rapid pulse rate was not quite so simple as he had stated it to be, and it was for that very reason that the digitalis test was so useful. He had stated that in a patient convalescing from rheumatic infection, a quick pulse meant that the heart was still the seat of active infection and further rest must be enjoined. A quick pulse rate might mean, however, want of cardiac tone, and want of cardiac tone meant that the patient had been in bed long enough, and should get up and take exercise. These two conditions could be distinguished by watching the effect of allowing the patient to get up. If the pulse remained rapid, infection was active and the patient must return to bed for a time. If the pulse slowed, the rapid rate was due to loss of cardiac tone and graduated exercise might advantageously be started. A quicker and safer test, however, was to give digitalis in large doses for two or three days and ascertain if the heart responded physiologically by slowing. If it did, the patient might get up, for there was no longer infection; if it did not, he must continue to rest.

They did not know the path of infection of rheumatism, and Dr. Emanuel hoped it would not go forth from that meeting that the rheumatic germ primarily gained access to the child by way of the tonsils, however common tonsillitis might be as a manifestation of rheumatism. On the other hand, if they believed that the organism did enter by that route then it was their duty to urge enucleation of

the tonsils as a preventive measure as soon after birth as possible. Then there would be no more rheumatism in children. With regard to secondary infection by way of the tonsils, in a child who had already had rheumatism and possibly had a damaged heart they knew that reinfection did not take place by this path, because enucleation of the tonsils did not prevent further attacks of rheumatism. On the other hand, septic tonsils must be adequately dealt with in the rheumatic as in the non-rheumatic child, just as carious teeth, rhinorrhoea, otorrhoea, and other foci of sepsis must be attended to on general principles. The more Dr. Emanuel saw of rheumatism in children, the more he saw that it resembled tuberculosis. In chronic tuberculosis, repeated reinfection took place from existing foci within the body, and so he believed it was with rheumatism—a second, third, and fourth attack of rheumatism in a child meant repeated reinfection from an existing focus in the muscles, joints, heart, or alimentary tract.

Given a case of subacute or acute rheumatism, had they any specific means of preventing a carditis? They had no specific antirheumatic serum, no specific vaccine. They were not serious in thinking that the heat of a fomentation, or the cold of an ice-bag, or the pain of a blister, or the terror inspired by leeches would prevent rheumatic infection of the heart. These therapeutic measures might have their use if only to give occupation to the nurse in attendance, but they could have no power in preventing infection of the heart.

What view were they to take to-day of the much vaunted drug sodium salicylate, introduced by Kolbe in 1876? It had been in use for forty-seven years—had it prevented endocarditis? They constantly came across diametrically opposite views. He read only a few weeks ago in the JOURNAL of the Association the serious recommendation to give sodium salicylate, 40 to 60 grains daily, for seven to ten days every month throughout adolescent life to prevent further reinfection, presumably in a child who had shown some manifestation of rheumatism. In contradistinction to that view, in the *Proceedings* of the Finnish Medical Society, Ehrstrom and Wahlberg pointed out that sodium salicylate could not be a specific remedy in spite of having steadily maintained that reputation for nearly half a century. Those authors compared, from their own hospital records, the incidence of rheumatic endocarditis in the thirty-four years preceding its introduction in 1876 with its incidence in the forty-four years following its introduction. They found that there was no evidence of diminution in the number of cases of rheumatic endocarditis in the post-salicylic as compared with the pre-salicylic period. That was strong evidence that sodium salicylate was not a specific drug against rheumatism. Nevertheless, no one would deny that it was an extremely useful drug in the treatment of acute rheumatism, for it diminished both pyrexia and pain in a truly remarkable manner. Even in that, however, it was not a specific drug, for it reduced pain and pyrexia in other non-rheumatic infections. Unfortunately for the young rheumatic victim, the absence of pain in muscles and joints and even the absence of pyrexia as well did not mean the absence of cardiac infection. On the other hand, the presence of pain in muscles or joints and of pyrexia was strong presumptive evidence of cardiac infection.

While he did not wish to minimize the value of sodium salicylate in the treatment of a case of rheumatism with pain and pyrexia, he wished to point out that its very power of being able to relieve these symptoms carried with it a very real danger, for its use masked two of the important symptoms that should make them suspect rheumatic carditis. One of his colleagues had said to him before he left Birmingham: "I hope at Portsmouth you are going to denounce sodium salicylate as a *cause* of heart disease in young people." He would not go so far, but he did agree that sodium salicylate had its dangers, and in this wise: They saw a child in the hospital out-patient department with growing pains. They sent the child home and told the parent to keep it in bed for a month and they prescribed sodium salicylate. In a day or two the pains had gone, and the mother, regarding the child as cured, allowed it to get up. Had they sent the same child home to bed with a placebo, such as aqua menthae piperitae, the pains might have lasted longer, but the child possibly would have been kept in bed for the full month. The employment of sodium salicylate in rheumatism was comparable to the use of opium in a case of obscure abdominal pain. They would cure the pain, but mask a symptom that might be of the utmost importance. They had no specific against rheumatic infection of the heart and they must recognize the fact.

There could be little difference of opinion that this country was badly in need of some form of further provision for the prevention and treatment of heart disease in young people. Dr. Emanuel was no advocate, however, for copying New York. He did not want a society for the prevention of heart disease, nor convalescent homes and schools for cardiacs, nor special cardiac clinics, nor occupation bureaux for cardiacs. They did not want to focus attention on the heart; their aim must be the treatment and prevention of rheumatism. The crying necessity in this country was for hospitals auxiliary to existing general hospitals, where children with rheumatic manifestations might lie until all infection had ceased and where they could then remain until the damaged heart had been trained to respond to effort to its utmost capacity. To these auxiliary hospitals there would also be sent young people with well marked evidence of heart disease, but in whom there was no active infection. Having no active infection, they would not be sent in with the object of rest in bed, but to have their hearts trained to respond to effort. It would have to be possible to keep patients in these auxiliary hospitals for a period of months, not weeks. It was essential that cases should be readily transferable from general to auxiliary hospital and back again without cumbersome machinery.

In the formation of these auxiliary hospitals two objects had to be kept in the foreground. (1) The education of the medical practitioner of the future—the medical student of to-day. Cases of rheumatism and heart disease in young people must not be drained away from the medical schools or else the medical student would go out into practice ignorant of this crippling disease, and he would be powerless to co-operate in the future in the prevention of a disease of which he would know nothing. That was no imaginary bogy, for it was exactly what was happening to-day with regard to pulmonary tuberculosis. (2) In regard to research, if they were to prevent heart disease they must prevent rheumatism, and to do this they must know a great deal more about the micro-organism of rheumatism, its site of entry into the system, whether repeated attacks of rheumatism meant fresh infections from without or repeated auto-infections from muscles, joints, heart, or alimentary tract. Lastly, they must know more of the relation between rheumatic endocarditis and so-called infective or malignant endocarditis. Investigations of this nature required clinical observations, plenty of cases, all stages of the disease from mild growing pains to fatal cases of infective endocarditis, bacteriological, pathological, biochemical investigations, *x*-ray and electrocardiograph examinations. The facilities and staff required for these investigations were already available at the general hospitals. It was therefore imperative, even if these auxiliary hospitals were paid for by the municipality, that they should be in the closest association with the general hospitals, where the facilities and staff required for research were already available, and where the medical practitioners of the future were being trained.

Dr. CAREY F. COOMBS (Bristol) differed from Dr. Emanuel as to the efficacy of salicylates in reducing the severity of cardiac rheumatism. A scrutiny of the notes taken at St. Mary's Hospital in cases under the late Sir William Broadbent showed that in the presalicylate period the cardiac lesions were more often severe and fatal than at the present time. Examination of the mortality records of Bristol showed that the incidence of fatal cardiac rheumatism was decreasing, but that the curve was falling less steeply than that of the general death rate. In that city, with a population of about 400,000, approximately eight deaths occurred each year from rheumatic heart disease, and to this must be added the fact that in each case death was preceded by a period of crippledom averaging as much as ten years. It was the prevention of this mass of misery to which the Association was being invited, by Dr. Allan

solution, to direct its energies. The programme before ny committee that would be set up might be divided into revention, propaganda, and treatment, and he hoped that revention would be given first place. Even slight cardiac heumatism might, as Sir Thomas Horder had taught, leave valve injured, too little, it was true, to lead to mechanical ardiac failure, yet none the less open to fatal infection of he type seen in chronic ulcerative endocarditis. For this eason, as well as for others already alluded to by other peakers, an examination of the conditions predisposing to nfection should take a foremost place, and in this connexion he Medical Research Council should be asked to co-operate s it had already begun inquiries of this kind. Dr. Poynton's plea for propaganda recently published in the BRITISH MEDICAL JOURNAL might be taken as giving a lead n this part of any programme of attack on rheumatic eart disease. As to treatment, he warmly endorsed Dr. Emanuel's plea for auxiliary hospitals where cases could be reated over long periods of time, in co-ordination with the xisting voluntary hospitals; and thought that much might e done at once if the Poor Law infirmaries were more eadily available for the purpose.

Dr. WILFRID ATTLEE (Eton) said that as a doctor to a ublic school there was one matter in connexion with this ubject which particularly interested him, and it was the are of the adolescent heart. In public schools they saw ery little of the rheumatic heart, in fact rheumatism and horea were decidedly uncommon in the type of boy who ent to public schools, at least that was their experience t Eton. In looking through the notes of old patients in he school, Dr. Attlee and his partner, Dr. Amsler, could nd only one case of definite chorea as having come under heir care during the last nineteen years, and they could not nd records of, or remember, a single case of rheumatic ever. Also in the medical histories of 1,600 boys as given o them when they entered the school, there was mention f rheumatic symptoms in only sixteen. So it was rare for hem to see a heart crippled by rheumatism. But there was type of heart which gave them a good deal of trouble, the eart which, in its physical signs, failed to conform to the rdinary book description of a normal heart, while it ppeared to do its work perfectly well. Numberless boys ame to the school with the statement that they had out-rown their hearts, or with histories of heart strain or some ther cardiac derangement. On going into the case it was sually found that the patient himself experienced no incon-enience, and had had no symptoms of any kind, but abnor-al physical signs had been noticed in the course of routine xamination. There might be a murmur or perhaps a eduplicated second sound, or some disordered action such s tachycardia on slight exertion, which ceased immediately he patient lay down, or arrhythmia. The boy, as a rule, ould play games without any distress and quite as well as ther boys. The abnormal signs were, as often as not, found ccidentally. They often varied from day to day, and ppeared to be as easily produced by a large meal as by xercise. The important point to him was the absence of ymptoms. In fact, in this kind of heart he emphatically ffered from the distinguished President when he said, in is well known medical notes on diagnosis, "One physical ign is worth many symptoms." In a boy's heart he believed ne symptom was worth many physical signs. However that ight be, the home doctor, in consequence of these signs, ften wrote to the school advising restriction of games nd sometimes even their total prohibition. Dr. Attlee ondered how far the total prohibition of games was ever ustifiable in these cases, and how far restriction was ecessary and advisable. Dr. Miller in his opening paper id the heart of a child never broke down by mechanical train alone, and to his mind there was considerable doubt hether the prohibition of games did any good to the heart self, though he had no doubt at all that it might do very nsiderable harm to the boy. People in general, he thought, id not realize what it meant to a boy at a public school to ave his games forbidden. Some boys, of course, were sourceful and could amuse themselves and fully occupy eir spare time, but for the average boy, for whom public hools catered, the consequences might be disastrous. He often got into a habit of loafing and became introspective and morbid, and in consequence a dull companion, so that he was a nonentity in his house. Even worse might befall him, and Dr. Attlee had known it to come finally to a choice between a possible risk of damage to a heart, and vicious habits which could not be stopped without games of some sort. The home doctor and the parents saw the boy only in his home, where his surroundings could easily be adapted to him, but at school they saw the other side of the picture, in which the square peg was with difficulty being squeezed into the round hole. So his partner and he aimed at getting boys on to some routine of games as soon as they could possibly manage it. Of course, they began gradually and watched for symptoms after each addition to the programme. The games as played in different schools varied considerably; thus football games at Charterhouse and Rugby and Eton were not in the least alike in the amount of energy and strain involved. It was really only the doctor at the school who knew just what was required of boys in any particular game, who could decide the form of exercise most suitable to any individual. At Eton they usually began a boy on short runs, fives, and squash racquets and cricket. Later came football in some of the less strenuous positions in the field. In athletic sports, short races such as 100 yards and high and long jumps seemed to put very little strain on the heart, and they could be allowed long before the quarter-mile and the steeplechase, races which were only suitable for the fittest people. Rowing came into a different category. A boy could row without going in for races, and could get very good and harmless exercise in doing so. At Eton the junior races were short races. The junior fours, which were bumping races, were rowed on four consecutive nights and each race lasted only a few minutes. The senior sculling, for which there was probably an entry of perhaps twenty of the bigger boys, lasted about nine minutes. These races, of course, gave rise to a good deal of strain. But Dr. Attlee often thought Etherington Smith was right in his view—a view held by other rowing men as well—that a boy's brain was seldom sufficiently developed to make him row himself really out. In other words, in the average boy the will power failed before the body was exhausted. He thought it would be interesting to know what had happened to some of his old patients who caused him or their home doctors anxiety as to their hearts while they were at school. So he wrote to several of them a few weeks ago. Twenty-one had replied, and not one had had any trouble with his heart since he left school. One who left in 1910 to go up to Cambridge caused the late Dr. Michell to write to him as follows: "X. is rowing. I think he is running a grave risk and have said so." That boy afterwards stroked the 'Varsity boat in two boat races and also rowed in a Leander crew at Henley. He had had no illness due to his heart since. Another who left in 1909 rowed in many important races at Oxford and Henley and had had no trouble since. Dr. Attlee concluded by quoting one letter written by an old boy who left fifteen years before, a letter which might well be taken as the text for these remarks: "Neither at school nor since has my heart caused me the slightest inconvenience or trouble. I suspect that the symptoms that you and other doctors discovered in me as a boy are common to all young animals when growing rapidly and call for no special treatment. Certainly cutting a boy off from his games is a big price to pay, unless the risk is a real one. If I had known then what I know now, I should certainly have quarrelled with my over-anxious mother on this point."

Dr. M. O. RAVEN (Broadstairs) said that there seemed to be general agreement that while fresh air was important in the treatment of the rheumatic state of childhood, the ordinary convalescent home was much too exciting a place for the successful treatment of rheumatic children, and the only solution was, as Dr. Miller had suggested, one of rest homes, where recent patients could have restful lives during their term of convalescence. One might also hope that to some of these laboratories might in time get attached, enabling bacteriological and pathological investigation of the cases—for example, in respect of the flora of the stools and the tonsils—to be co-ordinated with the clinical work. In the meantime, at such a rest home, one

was confronted continually with two questions: (1) How long to keep the patients; and (2) how much rest to give them.

(1) With regard to the length of time required to prevent recrudescence of active symptoms, the experiment already referred to by Dr. G. A. Allan, where 65 cases of "potential cardiacs" were observed for average periods of four and a half years, led to the conclusion, amongst others, that no less than three years must elapse since the last recrudescence before a child could be regarded as reasonably safe from further relapse.[1] These children were presumably, however, treated while living in their homes, and it might be hoped that the influence of fresh air might be found to cut short such an extreme figure. Nevertheless, it seemed that they needed to take a longer view of the time element required to effect a cure in these cases, if they were to attempt to get better results than those which were at present obtained. So far, among 44 cases treated at Broadstairs, it had been possible to trace 19 children through periods of eighteen months; these cases remained at the seaside for periods varying from six weeks to twelve months, and were able to be re-examined after living normal active lives in London, attending the ordinary schools, for at least seven months. The results, if so small a number might be taken as any test, suggested that the children were subject to relapse in proportion to the shortness of their stay in the country; the longer they had stayed the less they seemed to have tended to relapse, and this to some extent independently of whether heart disease had originally been present or not. Thus, of 8 cases of "potential cardiac disease," in which the children had had true rheumatic symptoms—for example, rheumatic pains and chorea—without having had any cardiac involvement, and were kept for only short periods of from six to twelve weeks, because they had no symptoms or signs—of these 8 cases 5 had relapsed, 2 of them having acquired active carditis; whereas of 11 cases, who were kept from four to twelve months because they had signs of heart disease on their arrival at the seaside, only 2 had relapsed, and these were both with them for periods not exceeding five months. The remaining 9 had held their own. It seemed, then, to be a proposition worth examining that a great deal of time and money at present spent in the treatment of chronic heart disease would be saved if every child who ever had symptoms of the rheumatic state were sent into the country for periods of, say, six to eight months before being re-exposed to the environment in which they originally contracted the disease. Such a scheme incidentally offered the best chance of curing chorea.

(2) With regard to the amount of rest required by the children, everyone would deprecate any kind of routine rest; no one would wish, for example, to keep a child in bed merely because it had once had rheumatism or because it had a damaged heart. But there were a large number of cases which fell within the category defined by Sir James Mackenzie when he said, "So long as there is positive evidence of mischief, for example, a persistent increase of rate, a changing murmur, or a diastolic murmur which has arisen during the illness, the patient should be kept at rest, and this should be enjoined until the rate is quite normal, even although six months may elapse before that result is brought about."[2] And when one had excluded the rapid rate of the heart beat due to merely mechanical causes—for instance, extensive adherent pericardium—and the excitable pulse of certain neurotic children, there remained a number of cases in which the increased rate seemed solely due to the rheumatic poison, and in which a long period of complete rest, extending for as long as four months, had resulted in the assumption by the heart of a deliberate and quiet rhythm, which had been maintained on the patients being allowed gradually to get up, and had been found still to have been maintained on re-examination of the heart after seven months' active and normal life in London.

Dr. Raven did not agree that physical signs of the heart gave no indication of persisting infection. Abnormal signs alone were no indication, but where the abnormal signs were changing, even in a favourable direction, then it was fair to assume that changes were taking place in the cardiac tissues, and that the stage of infective activity and tissue response to it had not been finally closed. Thus also, with time, systolic murmurs would disappear in some cases, and the area of cardiac dullness would diminish. But the sign most liable to change was the extremely common diastolic apical bruit described by Dr. Cheadle as the earliest sign of mitral stenosis.[3] That bruit appeared to be capable of observation and management of the greatest importance in the prevention of mitral stenosis; it was also very commonly associated with a persistently rapid heart beat. First occurring, as described by Dr. Cheadle, as a reduplicated second sound heard in the apex, it changed as disease progressed to a position in mid-diastole, and later still took on a prolonged pre-systolic character. Eventually, if untreated, this would tend to become the rumbling pre-systolic murmur of true mitral stenosis, but if treated by rest in an earlier stage it might be found in time to retrace these steps, first becoming mid-diastolic and then occurring as the apical reduplicated second sound. Finally, it might altogether disappear and remain absent on the patient's being allowed gradually to get up, and in four cases it had been found to be still in abeyance on re-examination of the heart after at least seven months' active life at home. In the light of this favourable sequence of events it seemed fair to suppose that the bruit was caused by disease of the mitral valve, and that the important thing was to allow the cusps of the valve, by sufficient rest, to return as far as might be possible towards their normal state, with a minimum of vascularization and cicatrix.

In the etiology of the disease it was of interest to inquire whether there might not be in the environment causing the original infection or recurrence a factor of infectiousness. The idea was not a new one; Newsholme[4] referred to acute rheumatism as an infectious disease having an epidemic prevalence with irregular periodicity, and recently in America figures had been brought forward in support of this possibility.[5] Dr. Raven was much struck with the disastrous effect of the introduction to his ward of a case of hitherto unrecognized and advanced heart disease; that boy had also an acute tonsillitis on admission, and was by mistake not isolated for about thirty-six hours. A nurse shortly after developed tonsillitis, and for some time afterwards they were troubled with recurring attacks of pyrexia in the children, only some of whom had tonsillitis, but in three of whom serious relapses occurred in the shape of recrudescence of the signs of mitral and pericardial disease, after they had made steady progress for many months or weeks.

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Dr. F. G. LAYTON (Walsall) asked for a definition of the term "rheumatism," and for the evidence on which growing pains were regarded as a manifestation of rheumatic infection. When patients were ordered by a physician in the out-patient department of a hospital to go home to bed for a month, the general practitioner should always be written to and asked to supervise treatment and the administration of salicylate.

Dr. C. O. HAWTHORNE (London) agreed with Dr. Layton that to provide the term "rheumatism" with a satisfactory scientific definition was a task not easily accomplished. Yet surely no one doubted that clinical states to which such a name could be reasonably applied existed, and that for the most part these states could be recognized. In particular, these rheumatic manifestations in children were specially liable to be complicated with cardiac disease, and the main purpose of the discussion was to explore any method by which such a complication could be avoided. Institutions and organizations directed to the care of children after the mischief had been done were all quite admirable in their way, but no great gain could be expected unless prevention could be secured.

agreed that the chance of prevention depended on propaganda relative to the subtle character and disastrous possibilities of rheumatism in childhood. But he did not agree that such propaganda should be restricted to hospital physicians or to some specially created league or committee. On the contrary, the most efficient agency, and the one which could be regarded most hopefully, was the general body of the medical profession. It was to individual rather than to mass teaching that expectation could be attached. Broadly the position was that rheumatism in adults was comparatively rarely complicated by heart disease while in children such complication was frequent. Further, the disease in adults was accompanied by pain in the joints, and this compelled rest from an early date. In children, on the contrary, rheumatic manifestations were not commonly accompanied by joint pains, and hence early rest was not secured. Was it not reasonable to suppose that therein lay the explanation of the escape of the heart in the adult and its penalty in the child? If that view was accepted, even as a possibility, the aim obviously was to secure for the rheumatic child the prompt protective rest which, so far as our present knowledge went, was the most helpful agency in the prevention of cardiac disease. This rest was not secured because parents did not know that what appeared to them minor ailments were really "rheumatism" and meant the risk of heart disease. They could only know these truths when the medical profession gave them the necessary information, and the individual who was likely to be most effective for this purpose was the family practitioner. In short, it should be the recognized duty of every practitioner when in any fashion he had learned of rheumatic tendencies in any family in his charge to warn the parents that such events as tonsillitis, growing pains, febrile temperatures, chorea, etc., meant in their children the danger of heart disease, and that only by complete and prompt rest could that danger be avoided. How far the universal adoption of that policy would be successful it was impossible to say. But at the very least the profession could claim that it had done its best to utilize such knowledge as it possessed for the protection of children from the incalculable mischiefs of organic heart disease. Such a course was an easy, simple, and straightforward one; it offered no interference with schemes for the treatment of actual sufferers; and it left open what other prophylactic measures the future might happily bring.

Dr. A. P. THOMSON (Birmingham) reviewed his personal experience in dealing with the problem at the Baskerville Institution in Birmingham. The outstanding clinical difficulties were two: (1) To determine when the infection giving rise to carditis had become quiescent. (2) To discover when the child had become free or relatively free from the danger of reinfection. He described the methods that he had made to obtain an answer to these questions, but stated that simple reliable tests of general application had not yet evolved. Dr. Thomson stressed the importance of education in dealing with these children and claimed that one solution lay in proper use of the Defective Children Act, but he agreed fully with the view that the patients should not lose touch with the medical schools.

Dr. ELIZABETH J. MOFFETT (Birmingham) said that the type of choreic or rheumatic case met with now certainly seemed to be milder than in the nineties. She found difficulties in diagnosis: a child was anaemic and under weight, and it was often hard to say offhand whether the tuberculous or rheumatic poison was the cause. The Birmingham mothers, in the city of Bright, Chamberlain, and Dale, were well up in all the symptoms of rheumatism, and rheumatic pains were just as useful as lumbago and sciatica in the war—especially when they occurred in a girl likely to be useful at home. Such cases were, of course, quite a minority and with clean tongue and normal temperature were better at school. It was, however, sometimes hard to be sure. The true cases were anaemic and had digestive trouble. Noticeable swelling of joints was rare. Treatment in the poorer classes was not satisfactory. Severe cases were admitted to hospital or infirmary. If not so severe, Dr. Moffett advised their own doctor at home or a free dispensary note with home treatment, or rest in bed, and she sent the school nurse to see that treatment was carried out. Later convalescence was given. Much longer periods of continuous treatment were, however, required. Recently the organizer of a very successful Cripples' Union had set out to form a similar society for the care of rheumatic cripples. The municipal Cripple School was taking a few of these cases. It was, however, a small number as compared with the total. The education of these children presented difficulties. They were backward from delicacy and prolonged absence from school. When they returned they were worried by their low position in school and tried to catch up, with the result that they often broke down again. They should be taught separately in smaller classes on a modified Dalton plan. Expense, however, barred the way at present. Dr. Moffett had a suspicion that the gap between the curriculum of the infant school and that of the upper school was too wide, and in the attempt to bridge it choreics were manufactured. She suggested making the transition more gradual, but she said that she was treading on dangerous ground there as she was not an educationist. Many heart cases were very resistant to advice and persisted in working beyond their strength, in spite of repeated warnings. When examining for the Women's Volunteer Reserve, early in the war, Dr. Moffett found a surprising number of organic heart cases among a set of young women of magnificent physique and very capable. Many were leading very strenuous lives with no symptoms and no knowledge of their cardiac trouble. It seemed cruel to enlighten them. She always warned the parent that it was not the heart condition that mattered, but the recurrence of rheumatism, and urged that they should put the child to bed if it were feverish.

Sir THOMAS HORDER (London) referred to the etiological difference which existed between mitral regurgitation and mitral stenosis. Although both of these forms of valve damage were undoubtedly due to the operation of the rheumatic virus, mitral regurgitation was in most instances the residual effect of an acute rheumatic infection, whereas mitral stenosis was generally a progressive sclerosing endocarditis resulting from subacute or chronic rheumatic poisoning. He quite agreed with Dr. Hawthorne when he said that, even though they might be ignorant of the chief causative agent in acute rheumatism, they were able to recognize the disease process within very narrow limits. He thought, however, that a much greater difficulty presented itself in the case of subacute and of chronic rheumatic infections associated with carditis; in them there was room for the consideration of non-specificity in relation to the various cases met with.

Dr. G. J. LANGLEY (Manchester) said that it was perhaps as well to remember that the recognition of subacute rheumatic phenomena in children might be exceedingly difficult, especially in the busy out-patient department of a general hospital, and the frequency of unexplained cardiac lesions later would indicate how frequently these cases were missed. Further, the investigation of rheumatism was included in the pathology of the streptococcus; the work of Rosenow in America and Dible in England showed only too clearly the great difficulties involved when dealing with this group of organisms, and so progress was doubtless delayed. Reference had frequently been made in the meeting to the parallelism between tuberculous and rheumatic infections, and Dr. Langley wished to carry this a step further. The work of Marcus Paterson had fully shown how a beneficial auto-inoculation might be both produced and controlled by graduated exercise in tuberculosis, the temperature chart giving a faithful record of the response of the patient to the inoculum. At present the response of the rheumatic patient to such inoculation was only recognized in the form of a recrudescence of the disease, and it was probably to this that the breakdown of rheumatic patients in adolescence might be traced. Such breakdowns would appear to be very frequent at the point of transition from school to wage-earning. It appeared to him that a recognition of the response to auto-inoculation in rheumatic cases might give as valuable a weapon in the treatment of chronic rheumatic infection as it had done in chronic tuberculosis.

Dr. ROUTH (Southsea) thought that there was too much fear in these meetings in looking at cases from the view of the expert or "specialist" rather than from that of the general practitioner. He was quite in agreement with the last speaker as regards the difficulty in tracing the cause of heart lesions in the young. In general practice acute rheumatism was a rare disease, though no doubt many cases of very mild rheumatic trouble were met with—so mild that they were not recognized as a streptococcal infection. In many cases tonsillitis was the only symptom, the parents being very averse from having their children's tonsils removed. He had at present under his care a child who suffered from repeated mild attacks of tonsillitis with slight pyrexia, each attack being accompanied by a transient mitral murmur which entirely disappeared with rest in bed and local treatment to the tonsils. There was a strong family history of rheumatism and the tonsils should certainly be removed. What struck one in private practice was the marvellous recuperative power of a child's heart and the way in which a heart apparently severely damaged might become perfectly normal in after years. As medical attendant at Uppingham School he met with boys who were sent to school as unable to play any games, but with carefully graduated exercise in a few years no heart trouble was discernible, and they could play football with perfect safety, and no bad after-effects were discovered. He thought that in many cases too much attention was paid to the condition of the heart and that children would do better if allowed to lead a more active life, careful watch, of course, being kept on them.

Dr. WITTINGTON (Hove) agreed with Dr. Attlee that properly regulated exercises were greatly to be preferred to depriving schoolboys of their games. When at Oxford thirty years ago he was told to give up rowing, but had he known as much then as he did now he would have preferred to have risked damaging his heart than to have given up rowing.

Dr. REGINALD MILLER, in reply, said he thought that Dr. Attlee's cases were not poisoned or infected hearts and should be treated on a nervous rather than on a cardiac basis. Swimming was not a satisfactory exercise for patients with functional cardiac disorders. He was glad there was general agreement as to necessity of rest, but too prolonged bed might be a drawback. Agreement also appeared to be general as to the value of salicylate treatment. It was satisfactory that the meeting felt the time had come for some investigation to take place, and it was the rheumatic side of the problem, and more especially its prevention, that must be stressed.

SECTION OF LARYNGOLOGY AND OTOLOGY.

E. B. WAGGETT, D.S.O., M.B., B.Ch., President.

DISCUSSION ON SPASM OF THE LARYNX.

OPENING PAPER

BY

SIR STCLAIR THOMSON, M.D.,
London.

IT is well for the opener of a discussion to begin by studying, and then keeping his mind well fixed on, what a committee would call "the terms of reference." When I received the honour of an invitation to inaugurate the debate of this morning my first step was to turn to what I hope I may, without conceit, call a well known English textbook. The first thing that struck me was that you can learn a good deal by reading your own writings! The second thing was to find, by doing so, a confirmation of the observation by Mr. Lloyd George in his recent speech at Oxford on June 22nd, when he remarked that "The fact is, in doing things, you discover how much more there is to be done."

Definition: "*Larynx*" or "*Glottis*."—Well, in StClair Thomson's book on *Diseases of the Nose and Throat** I looked in vain, in the index and in the text, for "Spasm of the larynx." I found "Spasm" all right—but no spasm of "the larynx." I think that textbook is right; for I looked up "Larynx" in *Stedman's Medical Dictionary* (1921 edition) and there read that the larynx is the organ of voice production, and that "the walls of this organ are formed by nine cartilages connected by fibrous membranes, and the vocal cords, enveloped in folds of mucous membrane." All these structures do not share in the "spasm" we are studying, so I think the author of this textbook was nearer to exactitude when he referred to the matter in the index under the rubrics of "Glottis" and of "Spasm of the glottis." The larynx as a whole is not thrown into a spasm: it is the canal or thoroughfare of the voice-box which is closed spasmodically. It might be still nearer to correct definition if we called it "Spasm of the walls of the glottis."

Definition of "Spasm."—To be sure that we would all be agreed about the term "spasm," I turned to the same medical dictionary (Stedman's) and found the term defined as "an involuntary, convulsive, muscular contraction: convulsion, cramp." Another dictionary does not limit our conception to a very rigid or prolonged contraction, for it defines "spasm" as "a sudden but transitory contraction of a passage, canal or orifice."[1]

CAUSES OF SPASM OF THE GLOTTIS.

The causes of glottic spasm may be:

(1) Local irritation.
(2) Irritation of the motor nerves.
(3) Central nerve lesions.
(4) Hysterical or functional disorder.

I. In the majority of everyday cases spasm of the glottis is a reflex phenomenon concerned with increased or diminished sensation in the pharynx or larynx. We will begin by systematizing these sensory causes.

Neuroses of Sensation in Glottic Spasm.

A. *Anaesthesia.*—There is much individual variety as to the degree of sensitiveness of the pharynx and larynx. It may be diminished (1) peripherally, by old age and anaemia, or by drugs (cocaine, orthoform, menthol, morphine, bromide, chloroform, and other anaesthetics), or by general affections like influenza, typhus, cholera, and pneumonia. It may be dulled (2) by affections of nerve trunks, as in the peripheral neuritis of diphtheria, or in cases where the superior laryngeal nerve (or its centre) shares, as often happens with motor paralysis of laryngeal muscles. Sensation may be reduced (3) by central affections such as the bulbar lesions of locomotor ataxy, general paralysis, glosso-labio-laryngeal paralysis, syringomyelia, multiple sclerosis, as well as haemorrhage, tumours, and gummata of the medulla. It occurs in a slight degree in hysteria and in epilepsy just before the seizure. These various causes lead to spasm by interfering with the sensation which watches over the glottis, to guard it from the ingress of foreign bodies or other irritants. We all know the sensation of a "crumb going the wrong way."

B. *Hyperaesthesia.*—But excessive or perverted sensation, by sending an exaggerated warning to the medulla, can also produce spasm. Amongst the causes of hyperaesthesia are many abnormal conditions of the general nervous system—anaemia, hysteria, neurasthenia, fatigue (physical, vocal, or mental), dyspepsia, excess of alcohol. Oversensitiveness is often present with acute or chronic laryngitis or pachydermia, and is also frequent at the menopause, in hypochondriacs, and in those who dread tubercle, syphilis, or cancer. Reflex causes of this hyperaesthesia may be traced occasionally to the various tonsils, the nose, ears, teeth, or the thyroid gland. It is, perhaps, most commonly met with as a very early indication of pulmonary tuberculosis. Many such cases go to the laryngologist, who is apt to overlook them. Tubercle in the larynx, by itself, seldom causes cough and spasm, any more than intrinsic cancer. It is quite usual to see a case where, during a year or more, a malignant growth has been steadily invading a whole vocal cord, without once having caused cough or spasm. Other frequent causes of hyperaesthesia—and hence

*London: Cassell and Co., second edition, 1916.

of spasm—are hysteria, tobacco, alcoholism, rheumatism, gout, and conditions causing local congestion, like emphysema. The mixture of emphysema and tobacco, on a gouty basis, is a frequent cause of cough and spasm of the glottis. That the local disturbance sometimes plays but a small part in these phenomena, in proportion to the central disequilibrium, is shown by observing how frequent these cases are in children who are the subjects of rickets, or tetany, or enlarged thymus, or of some general enfeeblement, and who have only a slight "catarrhal laryngitis."

II. *Neuroses of Motion in Glottic Spasm.*—But not only sensory disorders, but irritation of the motor nerves may produce spasm. Any lesion which irritates the recurrent laryngeal nerve in the neck, or on the left side in the mediastinum, may excite spasm. Hence it may be caused by aneurysm, tumours, or cancerous growths in the mediastinum or oesophagus, glands in the neck or mediastinum, goitre, tuberculous glands, or tuberculous pleuritic lesions.

III. The central nerve lesion which most commonly produces spasm is that of locomotor ataxy. Glottic spasm may also occur in tetany.

IV. Hysterical spasm is a well known form of functional inspiratory glottic spasm in adults. Functional spasm occurs in epilepsy.

The Phenomena of Glottic Spasm.

Whatever the cause—whether peripheral, or in the course of a sensory or motor nerve, or central—the sequence of events is much the same. They begin with a sensation of tickling or irritation in the larynx; short, sharp, and sudden coughs are thus stimulated, and in these the expiratory efforts follow each other so rapidly and are so in excess of inspiratory movements, that the patient realizes that he is rapidly losing his capital of reserve air. This alarms him, and if he has had similar attacks previously, the auto-suggestion of memory adds to his anxiety, weakens the volition with which he might still check the oncoming spasm, and precipitates the climax. This is reached when there is no more pulmonary air to expel; all breathing ceases, with the cords spasmodically clenched together (or, in the case of abductor paresis, with the flaccid cords sucked together by the negative chest pressure); the patient's face looks agonized and is pale or cyanosed and bathed in perspiration. In this drama—which may end in a tragedy—fear, apprehension, neurasthenia, hysteria, vanity, and desire for theatrical effect, may all play their part.

The attack ends (1) by resolution, the cords partially opening to allow a long-drawn stridulous or sonorous inspiration; (2) by death from asphyxia; or (3) by death from cardiac syncope. Relief may not be immediate and complete; a slightly stridorous cough may remain; and the attack may recur with equal or diminished intensity.

The fatal cases are generally ascribed to asphyxia. But I have often noted that most cases of death following on a gradually advancing laryngeal stenosis (whether mechanical or muscular) show the symptoms of cardiac syncope from a bulbar reflex, rather than those of asphyxia. I only mention this, in passing, as it is part of an allied subject I am now studying.

True glottic spasm occurs in certain organic affections of the motor nerve centres in the medulla; the most common is that produced by locomotor ataxy. These *laryngeal crises of locomotor ataxy* are particularly interesting as they may occur amongst the very earliest symptoms of this disease and are liable to be misunderstood.

A hospital patient consulted me for some slight discomfort in his throat. I found an abductor paralysis of one vocal cord, and further investigation showed loss of knee-jerks, Argyll Robertson pupils, but no ataxy or other symptoms of tabes. He mentioned that he was also subject to "spasm of his throat" and faintness. At one of his visits he reported that he had been seized with one of these attacks in the street, had lost consciousness, had been picked up by the police, and as they detected an odour of alcohol in his breath, he had been carried off to the police station. (It was soon after luncheon, at which meal he had imbibed a whisky and soda!) He sent for his brother, who had to produce his hospital ticket and other evidence that he was under my care, before he was released. It was lucky for him he was not ataxic!

Bulbar crises, according to P. Watson-Williams,[2] may follow diphtheria. I have no experience of these, and only know the usual spasmodic glottic closure which takes place when, owing to post-diphtheritic anaesthesia of the pharynx, food or drink may enter the larynx. Glottic spasm may also occur in tetany. In hydrophobia there is spasm of the abductors.

As we well know, several *chest lesions*, by pressure on the recurrent laryngeal nerves, may cause paralysis of one or both vocal cords. The most common are aneurysm, enlarged glands, and malignant disease of the mediastinum, the oesophagus, or the thyroid. I have notes of 11 cases in which this paralysis was caused by pulmonary (probably pleural) tuberculosis. Now, in all such cases, not only may the lesion in early stages—before the nerve is compressed—cause, by irritation, attacks of glottic spasm, but these may occur after paralysis has been established. In other words, these and similar lesions may cause spasm, or paralysis, or both.

Gouty, Rheumatic, Cardiac, or Pulmonary Causes of Spasm.

No inconsiderable number of cases of spasm of the glottis have come under my observation which were functional, which never developed into any serious local trouble, but which seldom got quite well. These generally occur in elderly men and are most common at night. The patient, as a rule, goes comfortably to sleep and wakens after midnight, or in the early hours of the morning, with an irritation or tickling in his throat; soon this becomes so violent and spasmodic that he springs from bed to rush for help or to hold on to some article of furniture while he passes through the stages described under "Phenomena of glottic spasm."

Similar attacks, in stout and elderly men with emphysema, may occur in the morning, while dressing. Slight pharyngeal irritation—like brushing the teeth—may start them; they may end with retching or vomiting and relief comes with the expulsion of much mucus from the trachea. They are less severe and alarming than when due to the following causes:

The cardiac causes are more anxious: they appear to be more frequent in emphysematous subjects; the attacks may be amongst the earliest symptoms of disease of the heart, aorta, or mediastinum.

The gouty or rheumatic causes are more difficult to diagnose and may only be postulated by a process of exclusion.

In that rare affection, true pachydermia laryngis, there may be spells of cough with glottic spasm. I have watched some cases for years. But I am not certain that the pachydermia is the cause, for I have seen the disease persist while the cough and spasms entirely disappeared.

Amongst toxic causes of glottic spasm, acting directly on the medulla, are the virus of *whooping-cough*—though I do not feel quite sure whether the laryngeal phenomena of this affection are due to adductor spasm of abductor paresis. Anyhow, typical attacks of what we call spasm are not unfrequently, and unexpectedly, met with in the abortive forms of pertussis occurring in adults.

A well known colleague in large practice in Bayswater called me up at 7 o'clock one morning to come along at once with my tracheotomy instruments as he was choking. I found him looking very distressed and in undisguised alarm about himself. He reported that he had gone to bed the previous evening feeling tired, but in his usual health, and had been troubled with a spasmodic cough through the night. In the small hours of the morning he woke with a feeling of strangulation and suffocation so severe that he lost consciousness. On recovering he felt intense irritation in his larynx, with explosive, spasmodic, and "choking" cough. He had to exert great self-control to mitigate these spasmodic coughs, and dreaded that if he had another he might choke to death in one of them unless I speedily performed tracheotomy, for which he was quite prepared. His face was dusky and suffused, his skin clammy with exhaustion and fear, and his pulse was bounding. His air passages were perfectly free, there was no stenosis anywhere, and his cords moved freely and normally. But there was very striking evidence of the stress and strain of the glottic spasm he had endured—the palate and fauces were irregularly studded with purple patches of ecchymoses. These were the consequences and not the cause of his choking spells. The severity of the latter was further shown by small petechiae on his face and body, and by a ruptured right membrana tympani, through which blood was escaping. No peripheral cause could be detected in his airways, neck, chest, or abdomen, and examination of his pupils and other reflexes as well as of his general nervous

system showed no central lesion. On asking him, he reported that he had been attending several cases of whooping-cough, and I told him that his alarming symptoms were due to an irregular form of pertussis, that he would get quite well, and that I defied him to choke! This assurance, with some doses of bromide, and some chloroform at hand for inhalation, soon comforted him, and I was glad to have my diagnosis confirmed by Dr. Wilfred Harris and Dr. Buttar. For some fourteen days he willingly remained in bed as he found that the slightest exertion or a breath of cold air brought on an attack, although none was so severe as the first. Bacteriological examination of the slight sputum disclosed the pneumoccocus but no Borget bacillus. The attacks gradually diminished, but continued for a month to six weeks.

Glottic Spasm and Drug-taking.—Attacks of functional glottic spasm may deceive the medical attendant, and the unjustified gravity with which he views the case generally adds to the severity of the attacks and the difficulty of curing them.

A young married lady, whose adenoids I had removed as a child and whom I knew as having a very bad family history of mental disease, developed, in the unwholesome atmosphere of life at Monte Carlo, attacks of glottic spasm. Under some trifling mental or physical stimulus (a discussion on "winning numbers"—save the mark!—or the inhalation of some extra cigarette smoke) she would spring from her chair, perhaps announce that "the chokes were coming," seize hold of a piece of furniture, or rush to the window for air, and then pass through the acts of what I have described as the "Phenomena of glottic spasm," watched by a devoted husband and an anxious maid. She was told that she might require a tracheotomy at any moment, and travelled to England with a cannula in her "vanity bag"! I found out that the husband, who had lived in the East, and had contracted malaria, not only was accustomed to give himself occasional doses of morphine, but, with that curious perversion of the drug-taker, so well described by Robert Hichens in his novel *Felix*, was gradually habituating his wife to the same vice. A little authoritative talk to both of them, and a sequestration of the tracheotomy tube, soon effected a cure. More than fifteen years have passed: the patient still moves in my horizon, but she has had no more "chokes."

Epilepsy: *Hydrocephalus.*—Whether the epileptic cry and the cry of hydrocephalus should be classed as examples of laryngo-spasm is, I think, very doubtful. They are certainly produced by involuntary, convulsive, and muscular action, and may be sudden and violent, so that they meet the terms of the definition of spasm I gave in our introduction. They are also produced in the larynx. But in all this they do not differ from laughter, or screams of pain, or similar joyous or grievous sounds which we do not admit to the catalogue of glottic spasm.

Laryngeal epilepsy has perhaps received a disproportionate amount of attention, as it was first so fully studied by the great Charcot.

Stammering.—Severe stammering is sometimes accompanied by sudden explosive enunciation, but it can hardly come into our list. It is on an exaggerated expiration that the sound is made.

Adductor Spasm or Abductor Paresis.

"When is glottic spasm not a spasm?" is a question which is far from being as trivial a matter as this way of putting it might suggest. When the vocal cords come together, either suddenly and temporarily, or gradually and more lastingly, we may be dealing with the resultant of one of two exactly opposite and opposing actions. This glottic closure may be a spasm caused by overaction of the muscles which close the glottis. A typical manifestation is that known to all of us when we "swallow the wrong way," or when some fumes directly irritate our endolarynx. But this closure may also be due to paralysis of the muscles which open the glottis—the powerful cricoarytenoidei postici. We remember that they are continuously acting all our life long, maintaining the thoroughfare of the larynx in that moderate degree of dilatation which we call "the position of quiet respiration," and which is midway between the position of complete adduction or approximation (that is, the position of phonation) and that of complete abduction (that is, the position of deep inspiration). When the "abductor tonus" disappears—as it does when the abductor muscles fail (that is, in "complete abductor" or "recurrent paralysis") or when they cease for ever (namely, in death)—the vocal cords approach each other and fall into the position we all know as "the cadaveric position."

Now this "cadaveric position" of paralysis is seen in the laryngeal mirror to form very much the same picture as does tonic spasm of the cords. Both these opposite actions—manifesting themselves by an identical picture—are also subject to the addition of occasional spasm. The "recurrent paralysis" is seldom complete; some reduced glottic space is nearly always present and some mobility is still left in the adductor muscles, and hence spasm of a dangerous and not infrequently fatal form, is apt to be superadded. So with the primarily "spasmodic" condition: it, in the mirror, forms exactly the same picture—the cords are seen to remain near the cadaveric position, making no wide excursions outwards to the site of quiet respiration or beyond it to that of deep breathing. They may, in some cases, adduct normally and the voice is then preserved; in other cases their approximation is ineffective and we have functional aphonia; and in either we may get added spasm; but, however alarming it may look, it is not fatal, although in this the practitioner is often deceived. He is deceived because he is unprepared or untrained to distinguish between the two conditions—the paralytic and the spasmodic. Even experts are deceived. In our Section of Laryngology of the Royal Society of Medicine I have seen several cases shown as double abductor paralysis, and confirmed by some members. To others, with more clinical acumen, they were at once recognizable as cases of spasm, and this diagnosis was confirmed by the progress of the case.

I have known of cases of women with dysphonic voices for years, in whom no one had ever succeeded in seeing the cords separate widely. Yet it only required the employment of one or other well known remedy to secure this. One is, with the laryngeal mirror in position, to urge the patient to utter an uninterrupted and long-drawn "E." If this is continued until she is absolutely "breathless," the cords will be seen to fly wide apart as, with a loud pant, she refills her empty chest. If this fails, one may succeed in seeing the same result by tickling her pharynx with the mirror, by blowing in some irritant vapour or powder, or by suggestion in various ways. I have known all these fail, and the diagnosis only settled, objectively, by placing the patient under a general anaesthetic.

Of course the narrowed glottis of this latter group is caused by adductor contraction, and any superadded spasm (that is, complete closure) is free from danger; for it only requires a certain degree of asphyxia to stimulate the intact cords to fly apart. In the former group the narrowing of the glottis is caused by true organic paralysis of the glottis-opening muscles; any addition to the permanently and irrevocably reduced ration of respiration may produce an asphyxia which may be fatal.

Semon's Law.—We remember that in true organic paralysis of intrinsic muscles of the larynx it is the opening, or abductor, muscles which are the first to go (Semon's law), while the adductors survive a long time. We are taught that in functional disease the reverse occurs: it is the glottis-closers which are the first to go and the openers which remain acting. This conclusion is illustrated by the well known condition of functional or hysterical aphonia, and it is generally the rule. But I have often wondered if this rule, so far as it refers to functional cases, is constant. For, to return to my query "When is glottic spasm not a spasm?" I assure you that it is not an indifferent and merely academical question. Our treatment of a case of intermittent stenosis of the glottis should be very different according to the conclusion we arrive at—if we reach one. Thus a paretic condition requires tonic, stimulating, irritative treatment; while a spasmodic condition demands the opposite line of relief—namely, the administration of sedatives and anaesthetics. The one condition may even be caused by a drug which relieves the other!

The "Spasm" of General Anaesthesia.—What is the *contracted glottis* and occasional clonic or tonic closure of *general anaesthesia* due to? Is it spasm and tonic action of the adductor muscles, or is it a paresis of the abductor (postici) muscles, or a temporary abrogation of that abductor tonus which is constant through physiological life? Anyhow, the lesion is a central one, due to the

action of the anaesthetic on the medulla. I have over and over again pointed out the presence and persistence of this stenosis during my operations of laryngo-fissure. The larynx is, in that operation, split open and absolutely shut off from any connexion with the trachea and lungs; the anaesthetic (administered through the tracheotomy opening) does not come in contact with the laryngeal mucosa, which is rendered insensitive with cocaine; and no mucus descends from the pharynx to irritate it. Yet the cords (or the one cord, when the other has been removed) remains in the cadaveric position, within whose orb it continues to make its limited to-and-fro excursions. Is this position due to spasm or paresis?

Laryngismus stridulus is, doubtless, the best known manifestation of "laryngeal spasm," but is it a spasm and due to overcontraction of the glottis-closing muscles, or may it be due to loss of abductor tonus or even paresis of the postici muscles? Certainly a very comprehensive and modern medical dictionary defines laryngismus stridulus as "a disease of children marked by sudden laryngeal spasm, with a crowing inspiration and the development of cyanosis."[3] I studied this question very carefully some years ago, before writing the chapter on the subject in my textbook, and then came to the conclusion that the phenomena were not caused by a spasm of the glottis-closing muscles, but by a paresis of the opening muscles; that it occurred more in the flabby and feeble than in the hypersensitive and readily responsive; and that, therefore, treatment by stimulation, tonics, and improved nutrition was not only indicated but was, in practice, more successful than soothing treatment by sedatives, anaesthetics, and so forth. It is certainly not due to a peripheral nerve lesion. There is no endolaryngeal cause, and the name, "laryngitis stridulosa," is a misnomer. It is curious that it should be more common in male children. But as we have the opportunity to-day of hearing the views of those who must see a good many more cases than the laryngologist, I should be very glad to hear their opinion on these points.

Is Hiccup a "Glottic Spasm"?—A sudden, complete, and involuntary closure of the glottis, announced by the well known sound, certainly takes place. But is the affection not a good illustration of my thesis that many cases of what are readily accepted as spasmodic contraction of certain muscles are really due to the paresis of their opponents? Surely the sudden, powerful, and irregular contraction of the diaphragm, innervated by the phrenics, is the most important feature; and this sudden unexpected descent takes the glottis, so to speak, unawares when its abductor tonus is impaired by neurosis (as in asthmatic or hysterical subjects), or when the respiratory centre is depressed by alcoholic intoxication, by uraemia, or after haemorrhage, cholera, or other serious illness. The spasm, surely, is in the diaphragm; the vocal cords, no longer held at the correct "concert-pitch" by the abductor tonus, are suddenly sucked together, and the characteristic click of a hiccup is directly due to a paretic and not a spasmodic laryngeal action.

Clonic Spasm of the Larynx.—Time does not permit of my referring to the interesting cases of rhythmical twitchings—clonic spasm or nystagmus—affecting the cords or arytenoids, and generally associated with similar spasms in the pharynx and fauces. They are said to occur in paralysis agitans, after meningitis, in syphilis of the brain, in pressure on the medulla from tumours of the cerebellum, and in disease of the medulla in the neighbourhood of the accessory nucleus.

Treatment.

As regards treatment I can be brief. It depends on the diagnosis and the etiological factors. It will vary according to our decision that the symptoms are produced by adductor contraction or by abductor paresis.

For immediate treatment, relief may be obtained by inhaling chloroform or nitrite of amyl. I have had some glass ampoules prepared containing chloroform (♏x), menthol (gr. 1/3), and iodide of ethyl (♏v). These can be always at hand, and, when required, the glass is readily broken and the contents inhaled. In functional cases the revulsive effect of strong smelling-salts, cold affusion, and suggestion will prove useful. The patient should be ordered to keep the mouth closed and to breathe quietly through the nose. A few puffs into the pharynx of a weak solution of cocaine (2½ per cent.) will check a large number of cases. It is not wise to put this remedy in the hands of patients with functional spasm.

Between the attacks the exciting cause must receive appropriate treatment. In all cases any source of irritation, such as dust, alcohol, tobacco, indigestion, or excitement, should be avoided. In functional cases the undue sensitiveness may be allayed by bromides and a sedative lozenge. But the important thing is to treat the patient's general condition by regulating the diet, hygiene, and habits, and eliminating all possible causes. In some inveterate cases I have traced the spasm to the morphine or cocaine habit.

The treatment of spasm of central origin is purely symptomatic, as the primary disease is usually incurable. In tabetic crises, bromides, iodides, chloral, antipyrin, and morphine quiet the excitability of the centre. Tracheotomy may be required, and I have had to advise in cases of recurrent paralysis associated with attacks of spasm. But I have never had to perform it during an attack, nor have I ever met with a case of functional spasm where it was necessary.

References.

[1] *The American Illustrated Medical Dictionary*, eleventh edition. [2] *Encyclopaedia Medica*, 1922, vol. E, p. 98. [3] *The American Medical Dictionary*, eleventh edition, 1921.

Sir JAMES DUNDAS-GRANT, K.B.E., M.D., F.R.C.S.,

Consulting Surgeon, Central London Throat and Ear Hospital.

After the interesting and stimulating review of the subject presented by Sir StClair Thomson, I propose to confine myself to a few personal observations and views. Such spasmodic conditions of the glottis may be due to hyperexcitability of the cortical centres for adduction of the cords (the phonatory centres), or to overaction of the centres in the bulb of which the adductor centres appeared to be the stronger. The former is probably the main element in the glottic spasm of children (laryngismus stridulus), the latter in adults.

Laryngismus stridulus must be distinguished from laryngitis stridulosa, the usual condition spoken of as croup. My experience confirms the statement that the former occurs almost exclusively in the subjects of rickets. In this disease there is a deficiency of calcium in the blood. Calcium is known to act as a sedative to the nervous system, and its absence leads to a relative hyperexcitability, with the natural consequence—an abnormally vigorous reaction to any irritation, either local or distant. Among the former may be cited the irritation produced by the increased pharyngeal secretion accompanying adenoids in the nasopharynx. A singular instance of a distal source of irritation is illustrated by the case of a young male infant brought to me in view of the possibility of laryngeal obstruction. The little patient had attacks of stridor with violent excitement, followed suddenly by a state of exhaustion. This suggested the infantile masturbation described most graphically in Braune's work on *Kinderkrankheiten*. Inquiry elicited from the father the observation that during the attack there was a condition of priapism, and on inspection there was found an excessive tightness of the prepuce. Circumcision was advised, and it was followed by complete recovery.

I have observed the occurrence of laryngeal spasm in women at the menopause. A very suggestive instance of laryngeal spasm of sexual origin is quoted by Moritz Schmidt as narrated by Stoerk. It occurred in the persons of an impotent widower and his second wife.

In tabes dorsalis laryngeal crises are known to occur. I have only seen one or two cases, and neurologists admit that they are very rare. The possibility of this cause must be kept in mind in cases of laryngeal spasm in adults. They have been found to be relieved by local anaesthetization of the pharynx—and consecutively the larynx—by

means of sprays of 4 per cent. cocaine. I have substituted for this eucaine with adrenaline. The local irritation probably acts only in the presence of such hyperexcitability of the cerebral centres as exists in the subjects of tabes dorsalis, the centres being probably those in the medulla. The laryngeal spasm producing the ictus laryngis, or so-called "laryngeal vertigo," has some points of interest. The patient feels a tickling in the throat, proceeds to give a slight cough, and finds himself on the ground. This has generally been attributed to a sudden congestion of the nervous centres produced by the pressure resulting from the expiratory effort accompanying the cough. My view is that the preliminary to the cough is an inspiration, and if this is accompanied by a closure of the glottis expansion of the thorax occurs without the entrance of air. The organs in the thorax expand and draw in blood. This causes some degree of drain on the cerebral circulation, which under certain conditions leads to a momentary anaemia of the brain and a sudden syncope, during which the patient loses consciousness and falls to the ground. Close questioning of the patients has convinced me that this is the actual course of events; I therefore prefer the term "laryngeal syncope" to that of "laryngeal vertigo." Why does this not occur much more frequently? In persons with normal arteries these adapt themselves to the change in pressure, but if there is loss of elasticity from arterio-sclerosis the adaptation is slow or incomplete, and syncope occurs. Those of my patients who have experienced this stroke have mostly been the subjects of gout and arterio-sclerosis. I believe, however, that in one case the main factor was instability of the vasomotor system, with neurasthenia due to overwork.

Sir StClair Thomson's inclusion of the glosso-pharyngeal nerve among those influencing the larynx is of interest in view of its share in the innervation of the tonsils and the lingual tonsil. The superior laryngeal also sends small branches to the lingual tonsil, and I look upon this region as almost a "motor point" for the larynx. I have frequently restored the voice in functional or simulated aphonia by applying faradism to the region of the lingual tonsil.

W. H. KELSON, M.D., F.R.C.S.,
Surgeon, Throat Hospital, Golden Square.

IT is impossible and unnecessary for me to deal with many of the points so ably raised and dealt with by the previous speakers this morning, but I will just touch on a few. I would, however, submit, in the first place, that the term "spasm of the larynx" is a little unfortunate, though in common use; for the larynx consists mainly of a partially ossified cartilaginous box or skeleton. If, however, we shift our position and speak of spasm of the glottis, we must remember that there is a false glottis between the ventricular bands as well as the true one between the true cords, and that this at times becomes spasmodically closed.

The compensatory mechanism by which one group of muscles gives kindly help to another when for some reason this latter is more or less put out of action is shown very well in the larynx, the false cords coming to the assistance of the true.

Possibly the term "spasmodic closure of the laryngeal airway," though cumbrous, might be correct.

The words "adductor" and "abductor" are so very similar both vocally and in print, that mistakes are apt to occur, and so I shall to-day, for clearness' sake, in my remarks, substitute the word "constrictor" for "adductor."

Although there may conceivably be spasm of the abductors alone, and it is often difficult to say whether there be spasm of a certain group of muscles or paresis or paralysis of its opponents, yet in either case the result will not be to reduce the airway, with the alarming symptoms one gets in constrictor spasm. The term "spasm of the larynx" as commonly used refers to this only: obviously a much slighter spasm of the constrictors will produce dangerous symptoms if the abductors be paralysed. The muscles which close the airway in the larynx are stronger than those which open it, therefore the tendency of any nerve irritation, whether direct or reflex, is to cause closure, and the *excitability* of the reflex mechanism being much more marked in children, attacks are more easily produced in them, especially at night when the higher controlling cerebro-cortical centres are in abeyance. We are all familiar with the spasm coming on in the inflamed larynx of false croup, and that set up by the introduction of the tip of the finger into the post-nasal space of a lightly anaesthetized child; any condition keeping up irritation in the larynx predisposes to spasm. In a child with papillomata under my care any excitement brings on an attack. Of underlying morbid conditions tending to spasm, rickets appears to be the commonest: the plausible suggestion has been made that the laryngeal attacks are analogous to asthma—the spasm attacking the larynx instead of the bronchioles. The examination of the larynx of a restless infant is by no means easy, and we find mistakes being made by most astute observers; for example, the so-called "congenital laryngeal stridor" of infants was described as due to spasm till shown to be produced by other causes. I happened to be working under Dr. Lack when he and Dr. Sutherland were investigating this affection, and had the advantage of seeing many of the cases; these showed clearly that the stridor was due to a collapsing of the too soft epiglottis and aryepiglottic folds, owing to developmental deficiency, which as time went on gradually disappeared.

In older children one meets with laryngismus stridulus, the phenomena of which have also been attributed to laryngeal spasm, but which has been more correctly described by Rehn as a spastic symptom-complex, and he says that, examination of the larynx being out of the question *during an attack*, the diagnosis as to spasm of the glottis is only speculative. Two remarkable cases of what appeared to be spasm of the glottis were reported in the BRITISH MEDICAL JOURNAL in 1898. Two children, apparently healthy, died within a few days of each other, the *post-mortem* examinations revealing rickets only. In both cases the faces became suddenly blue and the bodies rigid, but no sound was uttered. It is not stated whether a foreign body was sought for. I once lost a patient, a child on whom tracheotomy had been performed ten days before. A nurse removed the outer tube, and the patient became blue and stiff, and died before it could be replaced. The *post-mortem* examination revealed congestion of the larynx only.

A rather interesting question arises as to whether simple spasm of the glottis—that is to say, when uncomplicated by other obstruction, such as blood clot or swelling—is ever directly fatal; personally I have never seen it. Passing on to laryngeal spasm in older persons we come to a wide range of affections, in many of which the central nervous system takes an obvious part; but the only one on which I shall touch for a moment is the hysterical form, and in this spasm and bad muscular balancing and inco-ordination seem to run riot. In the BRITISH MEDICAL JOURNAL (1871) a striking case is recorded of loud stridor, both expiratory and inspiratory, in a woman of 24, who had previously presented various hysterical phenomena. On laryngoscopical examination the glottis was seen to be partially closed during inspiration by irregular muscular action. On putting the patient under chloroform the noise ceased, but returned with the return to consciousness. After the administration of a few doses of chloral the stridor ceased, but was replaced by aphonia.

One case of this kind I shall always remember. Some years ago a girl, who emitted a very loud, unpleasant, high-pitched stridor both with expiration and inspiration, was shown at the Medical Society of London. The attacks were continuous but came on at any time and without any apparent exciting cause. The late Sir Stephen Mackenzie diagnosed the case as hysterical, and, undertaking to cure her, took her into the London Hospital. The treatment consisted of galvanism, which I as his house-physician had to apply to the throat whenever the noise started, day or night. This was done, and she left apparently cured after six weeks in hospital.

GENERAL DISCUSSION.

Dr. Peter Macdonald (York) stated that he had had a special opportunity of observing this condition, as a near relative had a partial thyroidectomy performed, leading to damage of the nerves of the glottis. She had had several attacks of laryngeal spasm each year, during sleep as a rule. One vocal cord was paralysed. A manœuvre which seemed to help was a knee-elbow position, with depression of the mandible, an endeavour being made at the same time to phonate the sound "aa."

The President said that the general practitioner saw these cases, not the consultant. Tracheotomy might actually be called for. He mentioned a case in which introduction of an endoscope gave rise to spasm of the larynx and diaphragm. He quoted Sir Felix Semon's advice to the patient to hold his breath while twenty was counted and then to take short rapid nasal breaths.

Dr. William Hill (London) quoted two cases, one a syphilitic who died in hospital without operation, while the other died, as laryngotomy was being performed, from heart failure.

Mr. A. J. Wright (Bristol) spoke on the occurrence of laryngeal spasm in whooping-cough in adults, and quoted a case which occurred in an old lady.

Dr. Dan McKenzie (London) said the cause of the condition had to be diagnosed in a few seconds. He agreed that the lingual tonsil was a common origin for the reflex.

Mr. Somerville Hastings (London) said that because it was rarely fatal, medical men were apt to feel too safe about laryngeal spasm. He recorded a case in which, locomotor ataxy being present, he performed tracheotomy and saved the patient.

Mr. E. D. D. Davis (London) quoted a case of spasm of the larynx following passage of an antral cannula.

Mr. Mark Hovell (London) referred to Morell Mackenzie's account of spasm; gastro-intestinal derangements, he said, were a large factor, which was most common among children of the poor. It led to enlargement of the lingual tonsil, which was the most prominent cause of glottic spasm.

Dr. Davidson (Queensland) quoted a case following an operation for tonsils and adenoids, which was cured by tracheotomy and artificial respiration.

Sir StClair Thomson, in reply, said that he was not averse to tracheotomy; he had ordered its performance often in tabetic cases. In regard to Mr. Mark Hovell's remarks, he always read Morell Mackenzie, and he agreed about gastro-intestinal trouble; the lingual tonsil certainly, in his opinion, deserved attention. Male children more commonly had laryngismus stridulus. The glossopharyngeal nerve was very important as a starting-point for a spasm. Sometimes artificial respiration was necessary after a successful tracheotomy.

Memoranda:

MEDICAL, SURGICAL, OBSTETRICAL.

ANTE-PARTUM HAEMORRHAGE DUE TO PLACENTA PRAEVIA, ASSOCIATED WITH ALBUMINURIA AND ECLAMPSIA.

The following case of placenta praevia associated with albuminuria, which is the second I have had, is perhaps worth recording, because when ante-partum haemorrhage is associated with albuminuria it is usual to regard the haemorrhage as of the accidental type. When, however, two cases like this occur in the practice of one medical man within two years, it seems probable that the association of placenta praevia and albuminuria is not uncommon, and that the usual inference that ante-partum haemorrhage with albuminuria means that the bleeding is of the accidental type is not always a safe one to make. The point has an important bearing on treatment because, although this particular case recovered under expectant methods, the mother would have been spared a recurrence of haemorrhage and probably would have recovered more rapidly from the albuminuria if labour had been induced, as is usual in cases of placenta praevia.

A married woman, aged 35, had two children; the first died in infancy, and the second when six weeks old developed snuffles and was cured by antispecific remedies. On April 18th, 1923, I received an urgent summons to visit the woman, and on arrival found that she had had a smart uterine haemorrhage, over a pint of blood having been lost. She was about six months pregnant. Haemorrhage had ceased. Her pulse was rapid and thready, the rate 120 per minute. She was pale and restless, and complained of pain in her back; she had no headache and no vomiting.

The history revealed that her last menstrual period was in September, 1922, but the definite date in that month could not be obtained. Examination per vaginam showed the cervical canal quite closed and, with the exception that a clot was found in the vagina and was not disturbed, the examination was negative. She was placed in the supine position and left, since bleeding had stopped, with instructions to send immediately should bleeding recur. Since I live at only a short distance away, I thought this quite a safe procedure. I saw her again on the afternoon of the same day and found her comfortable.

At 3 p.m. on the next day I received a message to visit her without delay, and on arrival I was told by the nurse that the patient had fainted. As soon as I commenced to interrogate her, she said she again felt faint, and she developed a slight but unmistakable convulsion of epileptic type, which lasted only a few seconds. In a short space of time she had two more convulsions of a similar nature; these were definitely eclamptic fits. I injected morphine, grain 1/4, and took a catheter specimen of urine, which on examination was found to be loaded with albumin. I then prescribed magnesium sulphate, ʒj every four hours, and ordered her to have copious draughts of water and barley water frequently; she also had a mixture of potassium citrate with spiritus aetheris nitrosi. At this time she was passing about a pint of urine in the twenty-four hours.

Next day she had no more convulsions and no further bleeding; she said she felt much improved. On the following day (Sunday) her condition was the same. On the Monday she was visited during the morning and her condition was found to be satisfactory. About 3 p.m. on the same day, however, I was called to her and found on arrival that she had had another smart haemorrhage. She was in a condition of collapse. On examination per vaginam the os could just admit the tip of the index finger; no placenta was felt.

A diagnosis of ante-partum haemorrhage of the accidental type due to toxaemia was then made, and the patient was strongly advised to go into hospital with a view to terminating the pregnancy. This she persistently refused to do. Mr. Carlton Oldfield then saw her in consultation with me on the following day and confirmed the diagnosis. From this time her temperature ranged between 101° and 103°, and the pulse rate remained at about 136, and markedly dicrotic. There was no further bleeding and very little pain, but urine was very scanty and the skin very dry. Her condition was most unsatisfactory and I began to despair of her life. On the Saturday, however, Dr. Alderton, with whom I am a partner, saw her in consultation with me. He confirmed the previous diagnosis and was also unable to make out any placenta praevia. Upon his suggestion I put the patient on tinctura jaborandi, ɱv every three hours, and also continued to give magnesium sulphate every four hours. In the evening, at 8.30, I visited her and not only found the skin moist, but discovered her to be literally bathed in perspiration and evidently responding to the treatment by jaborandi. Her temperature was now normal, but the pulse rate was the same and her mind was still confused at intervals.

From this time onwards the temperature was mostly normal or subnormal, and on two occasions only was raised to 100°. Urine was copious, between one and two quarts daily. The pulse rate gradually came down to 112, and then remained at about 100 to 110. A month later, on May 26th, I went for a holiday and left the patient under the care of Dr. Alderton. On the night of May 29th, at 11 o'clock, he was urgently summoned, and on arrival he found that there had been severe haemorrhage. On examination the os was found to be dilated to half an inch, and a central placenta praevia was found to be presenting. The placenta was quickly stripped, a leg brought down and delivery completed in about a quarter of an hour. The child, judged to be at the eighth month, a female, was alive, and both have since done well. I examined a catheter specimen of urine on June 21st, and found only a trace of albumin. The mother is now up and about.

Lionel W. Bradshaw, L.R.C.S., L.R.C.P.Edin.
Barnoldswick, near Colne, Lancashire.

ACUTE INTUSSUSCEPTION IN AN INFANT: RESECTION: RECOVERY.

ON June 19th, 1923, I was called out by Dr. Garner of Birkenhead to see a small patient of his. The infant was a girl, three months old, who until the present illness had been in excellent health.

On the previous day there had been a sudden attack of abdominal colic, intermittent in type, accompanied by screaming, which some hours later was followed by the passing of a small amount of blood per rectum. The colic continued, and later much blood was passed. The colic ceased and the child became quiet, but as the haemorrhage continued the parents became alarmed and during the night called in their doctor. The infant was now very quiet, and as it was still losing blood he plugged the rectum. He saw the child again later, when it looked very ill; the haemorrhage had stopped, but it had been vomiting at intervals during the early morning. When we saw the child about 9.30 a.m. the eyes were sunken, the face blanched, and it took notice of neither parents nor strangers. The screaming had long since stopped, and it was abnormally quiet. Abdominal and rectal examination revealed a large tumour in the left flank. Intussusception was diagnosed and immediate operation advised.

The operation was carried out through the usual incision. A large intussusception was found extending into the pelvic colon, which was easily reducible as far as the splenic flexure. Reduction then was very difficult, and after a further two inches or so had been dealt with became impossible. On making further attempts to effect reduction the bowel wall commenced to split. I decided to resect the whole remaining mass and perform a lateral anastomosis. This resection included the last six inches of ileum, the caecum, ascending colon, and about half the transverse colon. On examining the specimen afterwards the intussusception was seen to be a double one; the last one and a half inches of ileum had projected through the ileo-caecal valve, and the remainder of the intussusception was made up of caecum and colon, with the ileo-caecal valve and this projection as its apex. The terminal portion of ileum, the caecum, and part of the ascending colon were gangrenous. This child made an uneventful recovery, left hospital fourteen days after operation, and is now perfectly well.

The case is most instructive on account of its rapid progress; careful inquiry elicited the fact that the condition had barely lasted twenty-four hours from onset to operation.

Liverpool. W. A. THOMPSON, M.Ch., F.R.C.S.

LARGE PLEURAL EFFUSION.

IT would be interesting to know what amount of fluid has been drawn from the pleura on the left side, as lately I have had under treatment a man, aged 36, who helped his father, a farmer, and called me in at the end of May owing to cough and breathlessness. He had been ailing since January or February with a cold and cough. He put it down to the cold and wet weather, and worked more or less all the time.

When I saw him his expression was anxious, and he was suffering from shallow breathing and slight cough. The temperature was normal, and the pulse 76, small and regular. I found the heart beating under the right nipple and dullness all over the left thoracic cavity. He was tapped, and one and a half pints drawn off. As the needle got blocked no more was taken then. Four days afterwards, in the cottage hospital, he was again tapped, and six pints measured drawn off.

After the operation he acknowledged he felt a bit better; no doubt he did. To have seven and a half pints of serum in the left thoracic cavity and to be able to get about and do any work seems impossible. At the present time he is gently getting about and helping with the milking. His complexion is much improved, and he eats and sleeps well. The heart has gone back to the left side; breath sounds are feeble; cavity tympanitic and voice sounds heard everywhere.

Is my case a unique one in the quantity of fluid evacuated? The prognosis in such a case is interesting; at present all is going well, and with the Buxton atmosphere we hope for the best.

Buxton. J. MCOSCAR, M.R.C.S., L.R.C.P.Lond.

Reviews.

THE ACTION OF ALCOHOL ON MAN.

IN writing *The Action of Alcohol on Man*[1] the aim of Professor E. H. STARLING has been to give an impartial account of the effects of alcohol on man in language intelligible to the general public. In the main portion of the book Professor Starling describes the pharmacological actions of alcohol; he then discusses the influence of alcohol on the community, and finally sums up his conclusions in a chapter of sixteen pages. The last third of the book consists of three appendices; in the first Dr. ROBERT HUTCHISON describes the use of alcohol as a medicine, in the second Sir FREDERICK W. MOTT gives an account of the relation between alcohol and insanity, and in the third Professor RAYMOND PEARL of Johns Hopkins University, Baltimore, analyses the statistical evidence as to the influence of alcohol on the duration of life.

The account given by Professor Starling of the pharmacological actions of alcohol is a lucid and impartial exposition of a highly complex problem. He describes the action of alcohol on each system of the body in turn, and begins each chapter with a clear and concise account of the physiology of the system described. The main facts regarding the action of alcohol are set forth, and the author not only states the chief experimental results obtained but also points out what these results really prove concerning the influence of alcohol in ordinary life.

The writing of an approximately accurate account of the simplest physiological subject without assuming any physiological knowledge on the part of the reader is, of course, a very difficult task, but the author has done more than this for he has given an extremely accurate account of a complex pharmacological problem every point in which has been obscured by controversy.

The main conclusions regarding the actions of alcohol are roughly as follows: Alcohol is a food which is absorbed exceptionally rapidly and easily, but its use by the body is hampered by certain important limitations. As regards the drug-like effects of alcohol,

> "apart from the results of chronic overindulgence in strong alcoholic fluids, the only action which is significant is its action on the central nervous system. . . . The action of alcohol from beginning to end is essentially depressant. . . . In the first place we can say that it is unsuitable for the highest mental efforts, or during the performance of prolonged muscular feats."

It is held, on the other hand, that in the less strenuous moments of life the mild narcotic action of alcohol may be of considerable service in conducing to repose and assisting digestion by promoting tranquillity. The immoderate use of alcohol is, of course, condemned, and immoderate use is defined as that which diminishes a man's efficiency and powers of performing his normal avocations. The limits of moderation are set at a regular ration of about a glass of wine or beer for lunch, and half a bottle of light wine or three ounces of whisky in the evening. It is considered probable that these amounts can be doubled on occasions without harm, but that the increased quantity will probably diminish a man's efficiency the next day. This account of the pharmacological actions of alcohol is quite unprejudiced and gives a perfectly fair selection of all the main work done on the subject; the chief conclusions would, we believe, be subscribed to by the great majority of those who have studied the question.

The appendix by Sir Frederick W. Mott on alcohol and mental disorders is interesting as he incidentally reveals many errors in asylum statistics; he concludes that "alcohol plays a relatively unimportant part in the production of certified insanity," but points out that all the evidence indicates that a mental deficient is made drunk by extremely small quantities of alcohol, and hence most mental deficients who have access to alcohol get the reputation of drunkards although they may consume very little.

[1] *The Action of Alcohol on Man.* By E. H. Starling, R. Hutchison, Sir Frederick W. Mott, and Raymond Pearl. London: Longmans, Green and Co. 1923. (Demy 8vo, pp. vi+291; 5 figures. 12s. 6d. net.)

Professor Raymond Pearl discusses at length the statistics concerning the influence of alcohol consumption on the duration of life. He shows that most of the statistics produced to prove the relation between the consumption of alcohol and the duration of life are riddled with fallacies. His conclusion is that the moderate use of alcohol produces no demonstrable effect on the mean duration of life, but that this is diminished by excessive drinking. As he points out, this is exactly the conclusion most unprejudiced observers have arrived at by the exercise of common sense. As an instance of the care needed in interpreting statistics, Professor Pearl gives a curve (p. 265) which shows that the death rate in the United States for the last fifty years has varied inversely as the consumption of alcohol per head. As the author says, "This diagram is rather striking, and at a first quite uncritical appraisement might seem to be filled with significance of a sort likely to be discomforting to a prohibitionist." He goes on to point out that the chart has probably no significance whatever.

This brief sketch of the book is sufficient to show how large an amount of interesting scientific information it contains.

The action of alcohol on man is, of course, a subject which those who desire to avoid controversy leave alone; presumably controversy has no special terrors for the authors of this volume, and they will probably enjoy the storm which it appears to be raising. Unfortunately controversy and in consequence public attention will probably concentrate on the least important passages in the book, for Professor Starling has a neat turn of phrase and a pleasant sense of humour. We have already seen one review which concentrated its attack on the statement that teetotal dinners were apt to be dreary affairs!

The chapter which deals with the influence of alcohol on the community certainly invites controversy, for in this connexion many social and economic factors have to be considered in addition to the pharmacological action of alcohol, and on these other problems the author naturally does not claim to speak with the same authority as he does on matters appertaining to physiology. Professor Starling's general conclusions are that alcohol is a pleasant thing, that it is often a useful thing, and that there is no reason to abolish it because it is abused by certain members of the community.

We are not prepared to agree with the author in all cases with regard to the relative emphasis he has laid on the various points that have to be considered in judging the action of alcohol on the community. Our chief criticism is that he hardly lays sufficient stress on the fact that alcohol is a habit-forming drug. Regarding this he writes:

> "Every action which is sufficiently often repeated tends to become a habit, and in habitually intemperate drinkers there is thus a craving for alcohol, i.e., an overbearing desire to take another dose as soon as the effects of the last begin to pass off. But this craving or habit is not as marked as in the case of other drugs" (p. 151).

It is quite true that the habit formed for morphine, for cocaine, and even perhaps for nicotine, is much stronger than that formed for alcohol, but with these exceptions alcohol may establish a stronger habit than almost any other drug; moreover, we would question the truth of the assertion that the formation of an alcohol habit is confined to habitually intemperate drinkers. This is rather an important point, for some writers have argued that drunkards are simply a class of persons with abnormally low self-control, and that alcohol does a service to the community by hastening their elimination. This view cannot be considered to be finally proved, and it seems much safer to assume that a normal individual risks the formation of an alcohol habit if he regularly exceeds a certain very moderate amount of alcohol for any prolonged period.

As regards the economic aspects of the problem, Professor Starling says:

> "In a recent paper by Professor Collis it is pointed out that in the United Kingdom the expenditure on food per head comes to sixteen guineas, and on alcoholic drinks to eight guineas. In itself this amount spent by the whole country on alcohol does not seem disproportionate, if we consider that half of the total sum spent in alcohol reverts to the State and is used for carrying on the business of the nation. Moreover, alcoholic drinks supply the most widespread and easily obtainable means of increasing the pleasure of life and of diminishing the frets and worries of daily existence."

This is an example of an individual judgement that is likely to be hotly contested. The statistics given would seem to suggest that the average adult male spends more on alcoholic drinks than he does on his food, and many will think that this represents a wholly disproportionate expenditure on a single luxury. The chief disadvantage of these excursions into controversial social problems is that they may divert attention from the remainder of the book, which is less controversial and of greater importance.

The book should be read by all those interested in temperance reform; they will do well to note the harm the exaggerations of some of their supporters have done their cause, for the authors of the book under review have had to spend so much space in disproving such statements that much more of the book is occupied with the defence of alcohol than would otherwise have been the case.

To-day any work on alcohol is bound, as has already been said, to arouse controversy. A few years ago only the temperance party were actively vocal, and as long as a writer confined himself to abuse of alcohol he was fairly sure of a quiet life; but now the friends of alcohol are banded in active trade defence organizations, and hence any statement regarding alcohol is sure to be assailed by one or both sides. The authors, however, may console themselves with the thought of Swift, who concluded a controversial pamphlet by expressing the hope that his arguments were so entirely reasonable as to command the assent of both sides. "But if that is not to be hoped for, my next wish should be that both might think me in the wrong; which I would understand as an ample justification of myself and a sure ground to believe that I have proceeded at least with impartiality and perhaps with truth."

KALA-AZAR.

Napier and Muir in their book on *Kala-azar*[1] state that the peculiar local conditions which determine the endemicity of the disease can only be ascertained by the study of accurate statistics collected by those on the spot. It rests with practitioners in the endemic areas to help to clear up the difficulties. The book is written with the intention of assisting practitioners in performing this task, by indicating the means of arriving at a sure diagnosis and the questions to which investigation should more especially be directed. The disease is stated to occur both in town and country, but chiefly in small compact rural communities. It is often found in old-established villages surrounded by trees and decaying vegetable matter, but not in new villages. It is a site, house, and family infection. The exact mode of infection has not at present been discovered, but the possible means of infection are transmission from patient to patient, directly or through the agency of excretions or secretions, or transmission by the agency of a blood-sucking insect directly from man to man, or through an alternative host (bats, lizards), or infection directly to man from an insect in which the microbe is the natural flagellate. Spread of the infection is conceivably by the excretions, from the skin surface or by the peripheral blood through the agency of a blood-sucking insect. There is at present no proof that any one of these is the route used, but the most probable routes are considered to be by the peripheral blood or from the intestinal tract. In hospital, cases of kala-azar are usually treated in the general wards, but no case of infection from the wards is known, although few hospitals are entirely free from the bed-bug. Of the blood-sucking insects the bed-bug is the most suspect, although the case against it is by no means proved.

The authors give a graphic description of the symptoms of the disease, but state that a diagnosis on clinical grounds only is seldom if ever justifiable. The less elaborate bedside laboratory methods of diagnosis include the aldehyde test, the blood count and examination of blood films, splenic puncture, and blood culture. The aldehyde

[1] *Kala-azar: A Handbook for Students and Practitioners.* By L. Everard Napier, M.R.C.S., L.R.C.P.Lond., and Ernest Muir, M.D., F.R.C.S.Ed. London and Bombay: Humphrey Milford, Oxford University Press. 1923. (Demy 8vo, pp. vi + 160; 9 plates, 6 charts. 8s. 6d. net.)

test is that from which most valuable information can be gathered and is the easiest to perform. If this reaction is strongly positive no further confirmation is required. A drop of 30 per cent. formaldehyde is added to 1 c.cm. of serum; in a well established case of kala-azar the serum will immediately set like white of egg, and the reaction is considered as absolutely diagnostic of the disease. The blood count is regarded by some as characteristic; there is marked leucopenia and a great reduction in the proportion of white to red cells. The parasite is present in the peripheral blood and by careful examination of blood films can be detected in nearly 100 per cent. of the cases. Blood culture on blood-agar gives equally good results. The authors furnish complete directions for carrying out these various diagnostic tests. The specific treatment of the disease consists in the intravenous injection of the sodium salt of tartaric acid, and cure may be anticipated in 95 per cent. of the cases, provided that the disease is not too advanced and that none of the more serious complications have developed. With regard to the duration of treatment a general rule is suggested, that if the temperature becomes normal in two weeks the treatment should be continued for two months; if in three weeks, for three months; if in four weeks for four months.

GONORRHOEA: BACTERIOLOGY AND TREATMENT.

THE book on *Gonorrhoea*[3] by DAVID THOMSON is the outcome of seven years' work by the author on the bacteriology of this disease. The author states that it was originally his intention to publish a series of papers dealing with the subject but that so much data accumulated that it became necessary to bring the information together in a book. In order to complete the work and to render it of greater value to the practitioner, the collaboration of various clinical workers was invited and chapters added on the abortive treatment of gonorrhoea and the clinical manifestations and modern treatment of the disease. The result is a very complete work on the subject, certainly the most complete that has yet appeared from a British author.

Perhaps the most remarkable feature in the book is the wide range of its references to foreign literature. In all some 2,000 of these appear, so that the work should be of the greatest value to anyone in search of the literature of any aspect of gonorrhoea. It is, however, in the main a treatise on the bacteriology of the disease and two-thirds of the book deal with laboratory methods. Few bacteriologists are more competent to deal with this subject than Dr. David Thomson, and his chapters on the cultivation of the gonococcus, its toxins, and the secondary organisms that are commonly associated with it, are excellent.

In a later chapter the author deals very fully with the question of immunization by means of vaccine therapy. He is strongly in favour of the use of specific vaccines in attaining this object, and although he is prepared to admit that the injection of foreign or non-specific proteins, such as typhoid bacilli, may bring about improvement, he considers that still greater benefit would have been obtained by the use of a vaccine that was specific. The same shock will be produced in the latter case if only a sufficient dose is given and specific antisubstances will have been formed. The fact that good results have been obtained by the use of the injections of typhoid bacilli may, he considers, be explained on the supposition that the chemical composition of typhoid germs resembles that of gonococci, both organisms being Gram-negative and easily soluble in weak alkali. The antisubstances formed against the one are, therefore, likely to act to a great extent as antibodies against the other.

In another chapter a full account is given of the author's work on detoxicated vaccines and replies are furnished to the criticisms usually levelled against this class of vaccine. More particularly is an answer given to the objection that a non-toxic substance which produces no reaction when injected is unlikely to produce antisubstances. In his opinion the toxic substances removed from gonococci by his process of detoxication are simple nitrogenous protein products that are of relatively little value in immunity. He states that these toxic products do not act antigenically when used in the complement fixation test, and that they are not to be compared with true exotoxins such as the toxins of diphtheria and tetanus bacilli. These true toxins, unlike the simple products removed in the process of detoxication, are precipitated by alcohol, and are highly complex protein substances resembling more those found in snake venom. However, in his later researches the author has avoided the use of strong chemicals and has prepared detoxicated vaccines with weaker alkalis. A short chapter on vaccine treatment in gonorrhoea has been contributed by Dr. Kenneth Maclachlan and chapters on infection, incubation, and abortive treatment by Mr. Claude Mills.

Part VI, on the clinical manifestations in the practical modern treatment of gonorrhoea, has been written by Dr. David Lees, lecturer and director of the Venereal Diseases Clinic, Edinburgh. These chapters are eminently practical and will render the book of greater value to those looking at gonorrhoea from the point of the clinician rather than of the bacteriologist. The illustrations, including some coloured plates, are excellent, and both author and publishers are to be congratulated on the way in which the book has been turned out.

[3] *Gonorrhoea.* By David Thomson, O.B.E., M.B., Ch.B.Edin., D.P.H.Camb., with contributions by David Lees, D.S.O., M.D., F.R.C.S.E., Claude H. Mills, M.R.C.S.Eng., L.R.C.P.Lond., Robert Thomson, M.B., Ch.B.Edin., Kenneth Maclachlan, M.B., Ch.B.Edin. Oxford Medical Publications. London: H. Frowde, and Hodder and Stoughton. 1923. (Double cr. 8vo, pp. xiv + 519; 19 plates, 22 figures. £2 2s. net.)

A TEXTBOOK OF BACTERIOLOGY.

THE fifth edition of the *Textbook of Bacteriology*,[4] originally written by HISS and ZINSSER and published in 1910, although following the early plan fairly closely is a larger volume than its predecessors and contains also a section dealing with pathogenic protozoa, written by Dr. FREDERICK RUSSELL. The book has been almost completely rewritten, the aim of the authors being to correlate bacteriological knowledge with the branches of medicine and prophylaxis to which it is most directly applicable. Being designed to supply the needs of both students and practitioners of public health as well as medicine, the book includes clinical and epidemiological data not usually found in textbooks of bacteriology; there is a section also dealing with infection and immunity. How well the authors have succeeded in keeping their textbook up to date may be exemplified by the fact that six pages are devoted to the so-called "bacteriophage" phenomenon of Twort and d'Herelle, and the recent work of Bordet and Ciuca is critically reviewed. The observations of Kruse and others, suggesting that the common cold is due to a filtrable virus, are also mentioned.

This book will be of more value to graduates working for higher degrees in medicine and for diplomas in public health than to the ordinary medical student. The needs of the latter are catered for by many excellent books of smaller dimensions and a more moderate price, and since the science of microbiology is advancing so rapidly it is not wise to recommend the medical student to purchase a volume which he will probably not find time to read during his student days. To those working for the D.P.H., on the other hand, the book will be very useful because of its broad and generous scope and because it deals with the origin and spread of epidemics. Previous editions have been very popular with D.P.H. students, and the fifth edition deserves the same regard.

It cannot be maintained, however, that the customary method of supplying to advanced students information about unicellular plants and animals is satisfactory from the scientific point of view. The activities of bacteria are being studied by medical, sanitary, agricultural, and industrial bacteriologists, and authorities in each of these departments write learned treatises on the organisms which happen to be of interest in their particular province and neglect those with which they have no immediate concern. It might be said, of course, that those readers for whom the present volume has been written would not

[4] *A Textbook of Bacteriology.* By Hans Zinsser, M.D., with a section on Pathogenic Protozoa by F. F. Russell, M.D. Fifth edition. New York and London: D. Appleton and Co. 1922. (Demy 8vo, pp. xiv+1193; 164 figures. 35s. net.)

expect information relating to dairy and agricultural processes, but from the public health point of view such information has great practical importance, and this able book would have been of even greater value had it drawn more attention to the wholesome activities of bacteria of use in dairy work, agriculture, and industrial processes. With these additions it would have better deserved its title of a textbook of bacteriology for students of public health.

FINGER-PRINTS.

DACTYLOGRAPHY, or the science of finger-prints, upon which Dr. HENRY FAULDS has recently published a manual,[5] is becoming yearly more important in the identification of dead bodies and in personal recognition for many civil purposes, such as registration of aliens, passports, and the identification of infants in orphanages, in addition to its use in criminal investigations. In the U.S. Army it is in general use, under the supervision of a large staff of trained experts.

The system is of little utility unless two conditions are complied with—namely, that the principle adopted in taking the impressions shall be sound and that the impressions when taken shall be indexed or catalogued in a manner to be readily available for comparison. In both of these particulars Dr. Faulds, who must be considered a pioneer in the subject of dactylography, early detected the essential requirements, and urged that deductions from single finger-prints were fallacious and that the ten fingers of the person examined should be imprinted, and recorded in their proper order. The importance of a satisfactory system of cataloguing the finger-prints of, for instance, 500,000 soldiers is obvious, and here again Dr. Faulds was perhaps the first to elaborate a practical method of classification. His plan however, was not at the time (1886) considered at Scotland Yard because the system itself had not then been adopted and legalized.

Dr. Faulds gives many interesting details of the history of finger-prints in ancient and modern times. In 1881 Bertillon published an account of his anthropometric system of identification; in 1894 a Government committee here recommended a system combining finger-prints with Bertillon's method, and the suggestion was adopted in India three years later; in 1901 the ten-finger method was adopted in England; in 1914 Locard of Lyons drew attention to the permanent location of the pores of the skin as giving proof of personal identity. A description and classification of finger-prints is given and details as to the precautions necessary in taking impressions and the fallacies to be guarded against in finger-print research. The book is furnished with a good index and glossary and many illustrations, and contains a chapter of practical exercises to be worked out by the reader. From the portrait at the beginning of the book and from the book itself one judges that the author, who is 80 years old, is as keenly interested in his subject to-day as he was fifty years ago. It is possible that the successful application of the science of finger-prints to the needs of society explains the admiration that Dr. Faulds evidently feels for the law; he says, "it is sublime function of law and its officers to aid men to keep on the straight and narrow line, whilst ethics, inspired by religion, gives them steam to go forward to their higher destiny." We hope, however, that some of us are able to walk straight towards our ideals without the aid of a policeman.

CYANOSIS.

Cyanosis[6] is the second volume in the new series of "Medicine Monographs," which come to us from Baltimore. The value of this form of publication is constantly receiving wider recognition and, in this case, we are indebted to American initiative for the promise of a new library of authoritative books designed to take up the discussion of recent progress in the study of special diseases and of subjects closely related to disease processes.

The authors of the monograph under review are C. LUNDSGAARD and D. D. VAN SLYKE, names familiar to all who have had occasion to follow the work on blood gases, and the reasonable outcome of such a collaboration is a book of real scientific interest and of considerable clinical value. The thesis of the authors may be admirably presented in their own words: "Cyanosis appears to be chiefly dependent on the absolute concentration of reduced haemoglobin in the blood, rather than on the ratio of reduced to oxygenated. About 5 grams of reduced haemoglobin per 100 c.cm. of blood appear necessary to cause cyanosis. . . . An anaemic with less than 5 grams of haemoglobin per 100 c.cm. of blood cannot usually become cyanotic." It follows that the cause of cyanosis, apart from imperfect circulation leading to capillary stagnation, is largely a matter of deficient oxygenation in the lungs. This may arise from imperfect oxygenation of the whole blood, such as results from the reduced oxygen tension at high altitudes, from oedema of the lungs and from lobar pneumonia. On the other hand the fault may lie in a failure to oxygenate a part of the blood at all by reason of its being side-tracked from ventilation. Rapid shallow breathing leads to a cyanosis of this type, and the same condition may be found in bronchopneumonia and in congenital heart disease with patent foramen ovale. The distinction is fundamental and of particular clinical importance. It follows immediately from the definition of cyanosis given above that only in the case of deficient oxygenation of the whole blood can improvement be expected by giving oxygen. Many clinicians will find here an explanation of their puzzling experiences in the use of oxygen in pneumonia.

Secondary factors modifying the amount of oxygen unsaturation necessary to give a blue colour and the shade of colour produced receive adequate discussion. The chief of these are, naturally, the thickness of the epidermis, pigmentation, and local variations in the skin vascularity. The main clinical conditions in which cyanosis is a symptom are considered in connexion with the causative and modifying factors present.

An excellent bibliography completes this attractive monograph, the "get up" of which is beyond criticism and prepares one for the rather stiff price of 2.25 dollars. We suspect that the difference in price to American and to other purchasers more than covers the additional cost of postage and, if this be correct, it would seem to be an unfortunate distinction. Had the book originated from a country with a depreciated currency this form of taxation would have been less irritating.

A LUGANDA TEXTBOOK OF MIDWIFERY.

IN noticing the publication of *Amagezi Agokuzalisa*[7] the reviewer is in the embarrassing position of having to state frankly at the outset that he is totally incapable of understanding a single word of it. In the interests of journalism it is seldom that such candour is admissible! For the 99.9̇ per cent. of our readers who are probably in the same quandary as ourselves in regard to this little volume let it be stated that an English preface reveals it as an elementary textbook of midwifery in the Luganda language, for the use of the native students in the Uganda Protectorate. The native population there is dwindling, largely owing to the ravages of venereal disease, the appalling mortality of childbirth, and the equally appalling number of stillbirths amongst the syphilitic mothers. The authors state that 66 per cent. of the adult female population have, or have had, syphilis. The mortality in the first year of infant life is 330 per 1,000, as compared with a rate of something like 80 per 1,000 in England.

In the face of these terrible facts the efforts of the authors and their colleagues in the Christian missions, as well as those of the Government, are gallant and worthy

[5] *A Manual of Practical Dactylography: A Work for the Use of Students of the Finger-print Method of Identification.* By Dr. Henry Faulds, F.R.Anthrop.I., etc. London: The "Police Review" Publishing Company, Ltd. 1923. (Demy 8vo, pp. 68; illustrated. Stiff paper cover, 2s.; cloth, 3s.)

[6] *Cyanosis.* By C. Lundsgaard and D. D. Van Slyke. Volume II. Medicine Monographs. Baltimore, U.S.A.: Williams and Wilkins Co. 1923. (Med. 8vo, pp. 80; 20 figures. U.S., Canada, Mexico, and Cuba, 2 dollars; other countries, 2.25 dollars.)

[7] *Amagezi Agokuzalisa* (Manual of Midwifery in Luganda). By Albert R. Cook, C.M.G., O.B.E., M.D., Senior Physician, C.M.S. Mengo Hospital, Kampala; and Katharine Cook, M.B.E., Superintendent, Maternity Training School, Namirembe; Certified Midwife; late Nurse, Guy's Hospital, London. London: The Sheldon Press. 1923. (Pott 8vo, pp. xii+228; illustrated. 2s. 6d. net.)

of all possible respect. Antivenereal treatment on a national scale has been applied during the last three years, and since 1919 the authors have been training midwives at a maternity training school in connexion with the Church Missionary Society's hospital at Namirembe, Uganda. Last year the Government of Uganda established a Central Midwives Board and a diploma in midwifery for the Protectorate. It is for these pupil midwives that this book is intended—to be supplemented, of course, by much oral and practical training. To judge from the chapter headings and illustrations it follows the accepted lines of the simpler textbooks in this country. It has been drawn up by the authors in faith and hope, and in the same spirit we congratulate them upon it and wish for it a very fruitful career. The excellence of its format is highly creditable to the Society, which has thus added one more to the large series of educational works in African languages with which it has enriched literature.

NOTES ON BOOKS.

THE eighth volume of *Medical Science: Abstracts and Reviews*, published for the Medical Research Council by the Oxford University Press, was completed in the issue for September, and an index is published in the first (October) number of the ninth volume. A feature of the periodical is that each number contains one or more reviews on some particular subject and that these reviews are accompanied by bibliographies. One of the reviews in the first issue of the ninth volume is by Dr. F. M. R. Walshe; in it is summarized the work of Magnus and his collaborators on the pharmacology of the nervous system, with special reference to postural and other reflex reactions. Through the work of Sherrington and Magnus it is now possible to form a fairly precise estimate of the origin and nature of many of the motor disturbances in hemiplegia and paraplegia, whereas we are still completely in the dark as to the meaning of the various components of the so-called "corpus striatum syndromes." The pharmacology of the nervous system must be resurveyed in the light of recent advances. Dr. Walshe's review consists of a brief discussion of papers recently published by Magnus and his school; they are the first applications of the physiological investigations carried out at Utrecht during the past ten years. They give an earnest of further advance in the knowledge of various disorders of function in the nervous system built upon the same foundation.

Dr. HENRI MALLIÉ'S little book on paratyphoid and Gaertner infections[8] is divided into four parts. The first consists of an historical and bacteriological account of paratyphoid bacilli, though here and throughout the book we miss any reference to *B. paratyphosus* C; the second part is devoted to etiology, morbid anatomy, and pathology; the third part deals with the symptoms and complications of paratyphoid fevers, the typhoid and gastro-enteric forms being discussed successively; and the fourth part is concerned with diagnosis and treatment. Useful statistics are given relating to paratyphoid carriers (p. 38), the incidence and mortality of paratyphoid fevers A and B (pp. 118–122), and the frequency of various complications, especially intestinal haemorrhage (p. 85). Special interest attaches to the prophylactic and curative administration of vaccine by the mouth in the form of Lumière's entero-vaccine, which has been successfully employed in France. The book contains a clear exposition of the subject, being written, as Professor Carles says in the preface, by a practitioner for practitioners, for whom, owing to the prevalence of paratyphoid fevers in France since the war, such a work will be specially useful.

The fourth edition of the *Handbook of Tuberculosis Schemes*[9] is similar to the previous edition on which we commented last year. For those who have not had the good fortune to encounter this book we may say that its general purpose is to supply information relating to the measures which are in use throughout Great Britain and Ireland for the control of tuberculosis. Summarized under county and county borough headings are preliminary data on the area, population, and industries of the district concerned, together with the death rate from all causes, and from pulmonary and non-pulmonary tuberculosis in the year 1922. Then follow details of the tuberculosis dispensaries, sanatoriums, hospitals, farm colonies, and open-air schools, and of the medical staff and care committee operating under the scheme. Admirable alike in arrangement and completeness, it should be found invaluable for all those engaged in the treatment of tuberculosis. We congratulate the National Association on this fresh product of its activity.

[8] *Les infections paratyphoïdes et gaertneriennes: Etude clinique et thérapeutique.* By Dr. Henri Mallié. With a preface by Dr. Jacques Carles. Paris: A. Maloine et Fils. 1923. (Imp. 16mo, pp. 196. Fr. 8 net.)

[9] *Handbook of Tuberculosis Schemes for Great Britain and Ireland.* Edited by the National Association for the Prevention of Tuberculosis. Fourth edition. London: George Pulman and Sons, Ltd. 1923. (Med. 8vo, pp. vii+293; 10 figures. 10s. 6d., post free.)

PREPARATIONS AND APPLIANCES.

Emetine Periodide.

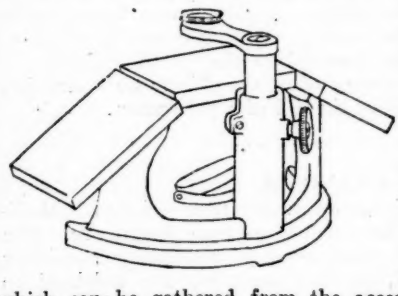
EMETINE PERIODIDE ($C_{29}H_{40}N_2O_4.6I$) is a preparation introduced by the firm of W. Martindale as a substitute for emetine bismuth iodide. This latter drug was prepared to enable emetine to be given by mouth in amoebic dysentery without producing vomiting. It was believed that it was insoluble in weak acids and would pass through the stomach without dissolving, but would be split and brought into solution in the alkaline contents of the intestine. Unfortunately emetine bismuth iodide slowly dissolves in 0.2 per cent. hydrochloric acid, and hence may exert an emetic action unless further protected by a salol capsule. The disadvantage of the latter procedure is that salol capsules are liable to escape solution in the gut and to be excreted unchanged. The preparation emetine periodide contains 38.7 per cent. emetine base. Its production appears to be a distinct advance on "emetine bismuth iodide," as it is almost completely insoluble in weak acids but is dissolved and split up by weak alkalis. Its chemical properties have been described by W. H. Martindale,[1] and as a result of extensive clinical tests on refractory cases of amoebic dysentery Dr. J. G. Willmore[2] concluded that it was "by far the most effective and at the same time the least toxic of all the emetine preparations which I have tried."

Scillaren.

Many vegetable drugs of established utility have not hitherto been brought under exact pharmaceutic control. Among these there are few of greater interest than squill. The potency of the active constituent and its minute and varying proportion have been causes of an uncertainty of action which militated against its adoption as long as only galenical products of the drug were available. A glucoside from squill is now being manufactured by the Sandoz Chemical Company which is claimed to be a product of definite identity. The article is sold under the name of "Scillaren Sandoz," and is supplied in the form of a solution and tablets for internal administration and also in ampoules for intramuscular or intravenous injection. Samples submitted to our analyst are reported by him to contain proportions of the glucoside which are too minute for a chemical estimate to be made of its individual quality, but his examination has enabled him to observe that the active principle has been so well purified as to admit of standardization of the preparations. It will be a cause of satisfaction to know that preparations of squill of standard activity are obtainable.

A Dissecting Microscope.

Messrs. R. and J. Beck (68, Cornhill, E.C.3) have recently introduced a new form of microscope for dissecting, which is much more handy than the old-fashioned wooden apparatus. Its main advantage, however, is in the absolute stability of the two hand-rests—a point of essential importance lacking in the apparatus commonly in use which follows the design of ordinary microscopes as regards the base and stage. In the Crescent Dissecting Microscope, the general character of which can be gathered from the accompanying drawing, the main casting is very wide and supports the hand-rests, so that there is no tendency to tip the instrument. The apparatus is provided with a large glass stage, and can be used with a single lens or, if required, the tube of a single or binocular microscope is readily inserted.



[1] W. H. Martindale, *Trans. Roy. Soc. Trop. Med. and Hyg.*, xvii, 1923, p. 27.

[2] J. G. Willmore, Ibid., p. 13.

British Medical Journal.

SATURDAY, OCTOBER 20TH, 1923.

THE PREVENTION OF HEART DISEASE.

THE Section of Medicine at the Annual Meeting of the British Medical Association addressed itself to one of the major medical problems of this country when it took up the discussion on the control of heart disease in early life. The report of the discussion will be found in this issue (p. 702), and the consensus of opinion points to a progress in the past so slow as to arrest attention and to warrant special inquiry into the best steps to be adopted to combat the disease. The subject for discussion was by definition limited to the etiology and treatment of heart disease in early life, and was therefore mainly directed to the rheumatic child. It is at first sight difficult to understand why so little has been done to combat the ravages of rheumatism in childhood when its later effects are so well known. Whether it be that the introduction of the stethoscope, as Sir James Mackenzie has suggested, or the more careful search into the morbid anatomy, or the greater attention that has been devoted to the intrinsic cardiac mechanism, has deflected at different times the minds of those interested in cardiac problems from preventive measures, it is idle to speculate. Rheumatism has been assumed to be one of the diseases associated with our country and climate, and rheumatic heart disease has been accepted as a natural corollary. Several influences are fortunately at work to terminate this attitude of passive acceptance of conditions which may prove, in large measure at least, to be remediable. The General Medical Council is preaching that the importance of prevention should be impressed on the medical student; the Ministry of Health pleads "for a new attitude toward heart disease which shall be etiological and prophylactic in spirit"; the example of New York, with its elaborate scheme for the prevention and relief of heart disease, has aroused thought; the very excellence of the work that has been done in respect of the diagnosis of cardiac disease and the arrhythmias has awakened workers to the fact that prevention must be sought along other lines. Whatever be the determining factor there can be no doubt of an awakened interest in the study of heart disease from the preventive aspect, and the Section of Medicine has asked the Council of the Association to appoint a special committee to inquire into the steps that may best be taken to combat the grave menace to the country arising from this cause.

In that type of heart disease which has its origin in early life, and of which, therefore, rheumatic infection in some form is the most frequent cause, real prevention must deal with the prophylaxis of that infection *per se*. Certain points raised in the discussion call for a full investigation. Among them are the predominating incidence of rheumatism among the poorer classes, the advantage of prolonged residence in fresh air and sunshine during convalescence in mitigating against the tendency to relapse, the habitat of the organism, and the relation of tonsillitis to the disease. Again, the close relationship between chorea and rheumatism is generally recognized. Dr. Fordyce, in an article on the care of the choreic child published this week (p. 700), has included in one group for administrative purposes excessive fidgetiness, habit spasm, and Sydenham's chorea, but this suggestion should not be allowed to obscure the more important issue and the clear connexion that exists between rheumatic chorea and heart disease. The conditions which predispose to rheumatic chorea are not necessarily the same as those which produce articular rheumatism, and the etiological factors would have to be investigated along parallel but not necessarily identical lines. Prone to relapse, and when recurring specially liable to be followed by cardiac involvement, it is one of the serious and intractable disabilities of childhood.

Difference of opinion exists as to the criteria which should be used to determine the cessation of the active period of the rheumatic infection in the child. This is a matter which ought to be settled, as it is very important in its relation to heart involvement and possibly also to the question of reinfection or recrudescence. Some have argued that the milder nature of the joint pains in the child as compared with the adult, and their speedy disappearance under the action of salicylates, are really factors which endanger the child's heart, because the child, being free from pain, may be allowed up sooner than the adult, whose more severe pains keep him in bed for a longer period; the more frequent involvement of the heart in the child than in the adult may thus, it is thought, be explained. Rheumatic fever is not in essence a simple joint infection, and it is doubtful if these arguments go to the root of the matter. The presence of blood vessels in the valves of the child's heart and their disappearance during early adult life, as has been demonstrated by Gross in his work on the *Blood Supply to the Heart*, affords a readier explanation. From figures reported in the discussion and from others that we quoted in a previous article (June 2nd, p. 942) it would certainly appear that the liability to relapse is definitely lessened by prolonged after-care or convalescence in the country under suitable conditions.

This raises the question of the provision of convalescent hospitals or cardiac homes where convalescent rheumatic children, with or without heart lesions, can be kept for periods of months. There are a very few in this country, but the experience at Broadstairs, though based on too few cases to justify a definite conclusion, seems to point to the fact that a residence of months rather than a period measured in weeks should be aimed at. It would appear that the much higher incidence of heart disease in rheumatic children of the hospital class as compared with children of the well-to-do is due to defective opportunities for prolonged convalescence. Thus while at Eton about 1 per cent. of the boys give a history of rheumatic infection, organic heart disease is practically unknown. The hospitals cannot supply the lengthy treatment required, nor are they the ideal places for recovery in the later stages. A similar remark applies to the ordinary convalescent homes, even those which admit such cases at all; nor are the majority of those which do prepared to keep the child convalescing from uncomplicated articular rheumatism for a sufficiently long period to be of practical value. Not a little attention was paid to this aspect of the subject at Portsmouth. Dr. Miller advocates special heart homes as the ideal. The reports from the few that have been opened in this country are encouraging. The convalescent care of cardiac and potential cardiac cases has been a special feature of the New York scheme, and there are now available about 400 beds

for the cardiac cripples from that city. Some of these are in special cardiac homes such as Dr. Miller advocates; others are in convalescent homes where special beds are reserved for cases recommended by the Heart Association. The need for such special heart homes would have to be placed before the charitable public, and to meet with satisfactory response it would need to be pressed with a weighty consensus of medical opinion. This would be one of the advantages of concerted action such as has been suggested.

Between the hospitals and the patients' homes there would always remain a gap, and this might be efficiently bridged by following up the children who leave hospital and who do not get institutional care by securing their attendance at special cardiac clinics, so that the earliest indications of relapse might be recognized and the lives of the patients guided along physiological channels. There has been sent to us by the Committee of Cardiac Clinics of the New York Association notes on its scheme of cardiac clinics, a synopsis of which we print in another column (p. 729). We do not suggest that it is necessary to follow the same lines, but the scheme is of interest as an indication of the thoroughness with which the matter is being taken up across the Atlantic.

It is not our province to prejudge the attitude that the Council of the Association will adopt to the request for the appointment of a special committee, but there can be no doubt about the importance of the issue. The figures supplied by the medical officers of the Board of Education are a sufficient indication of its magnitude. It would appear to be a case where united action is indicated. The Medical Research Council is already dealing with one aspect of the subject; school medical officers have to take cognizance of its presence, and in some instances have had to arrange for the education of affected children in other than ordinary schools; isolated attempts have been made in different parts of the country to provide institutional treatment of a special kind, but to an extent that only touches the fringe of the problem. How much has been done in the past to inculcate into the minds of the students of medicine the natural history of the disease in such a way as to open their eyes to the possibility of preventive measures it is difficult to say. Much more must be done in this direction if medical students are to enter the profession imbued with that appreciation of the significance of the preventive aspect of medicine which the General Medical Council desires. In many parts of the country the lay public are ignorant of the possibility of rheumatism as an affection of childhood or of its relation to heart disease. When one hears that in a school like Eton, to which we have already referred, about 1 per cent. of the boys give a history of rheumatism and that heart disease is rare, while in some schools under the education authority about 1 per cent. have rheumatic heart disease, the prevention of heart disease becomes a problem well worthy of attack by all the weapons at our disposal.

THE HARVEIAN ORATION.

It has always been a tradition of Linacre's college to honour and cultivate classical learning, and in Professor Starling's audience on St. Luke's Day some must have recalled Tully's noble panegyric,* and in recalling the great Roman's words must have applied them not to the *doctrina* Tully had in mind, but to the wider *doctrina* of which Professor Starling's discourse was the fruit; the *doctrina*—we had almost written the gospel—which inspired him to say, "I feel that I have had the good fortune to see the sun rise on a darkened world, and that the life of my contemporaries has coincided not with a renaissance but with a new birth of man's powers over his environment and his destinies unparalleled in the whole history of mankind."

This *doctrina* can only be possessed by one to whom Harvey's injunction to "search out the secrets of Nature by way of experiment" is an absolute rule of life, not merely a stimulant of rhetoric.

Many do lip service to the cause of "research" whose lives and actions are far more hostile to the real searching out of Nature's secrets than any of the traditionalists who fought against Harvey, for many of these did have a passion for truth, and erred from deficient plasticity of intelligence rather than from a false or base choice of object. Those who now clamour for the direction of research to "practical" objects have none of the excuses to be urged in behalf of the anticirculationists, not even that of loyalty to the teaching of a great master. "For the full and untrammelled exploitation of the advantages of the experimental method it is essential that mere material advance shall not be the target of our ambition." These are Professor Starling's words. The story of progressive comprehension of the manner of functioning of the heart in health and disease, the account of the correlation between all organic systems and of its material basis, two chapters of the book of life many pages of which have been inscribed by Professor Starling himself, are worthy comments upon the text.

The sermon is on an old text; it has been preached by the words or exemplified in the lives of all the men the Orator named—Boyle, Mayow, Hales, Cavendish, Lavoisier, Bernard, Pasteur. All studied out the secrets of Nature, not over-curiously considering whether the precise secrets which fascinated them held or did not hold the clue of some practically important mystery. In these days, when great wealth and power are often in the hands of well intentioned but ignorant men, the scientific worker is subjected to a temptation not so severe as confronted his spiritual ancestors in the Middle Ages, but severe enough. No student of Nature's secrets now runs the risk of being burnt alive. But he must often choose between hopeless poverty and obscurity on the one hand and spiritual slavery on the other. It may often be quite good business to sell one's soul; it is obviously better to sell it than to lose it like Peter the Politician in Mr. Belloc's story. The statistical probability that the most disinterested student of Nature will become a Lavoisier or a Pasteur is extremely small, and the chance that his wife and family will enjoy as many of the material advantages of life as the dependants of a fairly prosperous grocer is not much larger. The director of the X.Y.Z. Institute for Research into Diseases of the Great Omentum may be a prosperous and happy member of society. He has lost nothing but a very small chance of becoming one of the *servi servorum* commemorated in a Harveian Oration.

Simony is, after all, not purely an ecclesiastical offence. Simon Magus, when he saw "that through laying on of the Apostles' hands the Holy Ghost was given," offered them money, saying, "Give me also this power." Peter rebuked him, saying, "Thou hast neither part nor lot in this matter." It is

* Nam ceterae neque temporum sunt neque aetatum omnium neque locorum; at haec studia adulescentiam acuunt, senectutem oblectant, secundas res ornant, adversis perfugium ac solacium praebent, delectant domi, non impediunt foris, pernoctant nobiscum, peregrinantur, rusticantur.

possible, and the temptation perhaps grows, to be simoniacal without buying or selling an advowson, but those who have been touched by the spirit will not sell their scientific birthright. Indeed, our own conclusion is almost as optimistic as Professor Starling's characterization of his own times.

SHALL THE APPROVED SOCIETIES RULE THE PROFESSION?

THE curt letter of the Minister of Health published in the SUPPLEMENT this week, which, at first sight at any rate, seems to be a refusal of parley, compels us to return to the consideration of the general position of the insurance medical service with regard to national health and to other branches of professional work. The issue, as we have shown, and will show again here, concerns not only those members of the profession who are on the panel of insurance practitioners but everyone who practises medicine in any of its branches in Great Britain. The axe is laid to the root of the tree.

In the leading article published last week (p. 669) attention was drawn to the wide extent and the great possibilities of the service, and to the persistent efforts that have been made on behalf of the profession by the Insurance Acts Committee to improve it by suggesting or accepting new arrangements to meet every legitimate criticism and by trying to cultivate a spirit of friendly co-operation with all classes of officers and administrators who are concerned in its working. We showed the dangers, both to the national health and to the whole medical profession, of a rate of remuneration which would narrow the outlook and stunt the developing usefulness of the service, and would alienate and dishearten large numbers of practitioners upon whose inclusion within it the real value of the service to the community depends. We appealed to the Minister of Health to take this wider view and to make some further proposals which would secure the full help of a contented profession.

It is a matter for extreme regret that the Minister has failed to use his opportunity. The Insurance Acts Committee, confident in the strength of arguments and facts there has been no real attempt to dispute, recommended that the matter in its economic aspects should be submitted to arbitration as in 1920. This has been refused—if we understand aright the closing paragraph in the Minister's unsatisfactory letter of October 15th. The result of any such arbitration would have been loyally accepted this time, as last time, by insurance practitioners, but this possible pathway to a peaceful solution seems to have been closed.

The course of events since the Minister made his offer of October 3rd (SUPPLEMENT, October 6th) has, however, made it evident that the purely economic question, important as it is, has become of lesser moment, and that the plain and clear issue now is whether the approved societies shall be allowed to control a national service, to dictate to Ministers, and to enslave the profession. In accepting this issue the profession will be fighting not only its own battle but that of the community at large. The question which the profession and the Government alike have to face is whether the public health and national aspects of the insurance system are to be sacrificed to the interests and power and selfish advantage of a mere section, the approved society officials, whose object, very little disguised, is to buy the medical profession outright at the lowest figure, and who, as the Insurance Acts Committee's reply to the Minister says, "it is only too plain, are concerned much more with the building up of surpluses than with the building up of a satisfactory National Health Insurance scheme which shall be preventive as well as curative."

The position and powers of approved societies in the insurance scheme were set out in general terms in our leading article last week. Through the efforts of the profession and by the deliberate judgement of Parliament they were excluded as such from the administration of medical benefit, but they are entrusted with great powers in respect to cash payments during incapacitating sickness and disablement, and with regard to certain "additional benefits." Ever since the first valuation the more successful societies, by unforeseen and doubtful interpretations of certain sections of the Acts and by uniting to establish a quasi-charitable society to do for them what they are unable legally to do for themselves, have attempted to exploit and control the services of hospital staffs and of consultants and specialists. Insidiously but constantly efforts are being made to extend and intensify this control. By the intricacies of insurance finance and by the technical crediting to them as a matter of book-keeping of sums of money contributed jointly by employed persons, employers, and taxpayers, approved societies are now claiming that they have a deciding voice as to the terms and conditions of service of insurance practitioners, and are explicitly denying the right of the Minister of Health to apply any portion of the National Health Insurance Fund to remuneration for these services beyond what they are themselves pleased to consider proper. It is to be hoped that there are some wiser officials of approved societies who view these developments at least with disquietude; but recent speeches and letters and statements by presumably responsible leaders of approved society opinion make it clear that their aim is to become the dominating factor in the insurance scheme and more and more completely the masters of the doctors. Approved societies have their proper place in the scheme, but it is not the place they are attempting to usurp.

This, therefore, is a matter affecting not only insurance practitioners, or merely such consulting physicians and surgeons, pathologists, and radiographers as may be rendering service in connexion with the additional benefits provided by some societies: the honour and interests of the whole profession are deeply involved in it. It is clear that all the efforts of the Insurance Acts Committee, prolonged and sincere as they have been, towards conciliation and the cultivation of a friendly spirit, have had not the slightest effect upon approved society leaders. Indeed an ostentatious lack of appreciation of these efforts, repudiation of previously accepted conclusions, misrepresentations of medical opinion, and a very regrettable disregard of truth, have increasingly become characteristic of their attitude. Boasts of the impotence of the profession and of what the societies will be able to do in the direction of a cheap medical service when they have established their power have become louder and more confident.

It is an imperative necessity for the profession to put an end to this.

The issue has now become at once more critical and more simple. Freedom from friendly society control was perhaps the most "cardinal" of the 1911-12 points. This freedom is now once more seriously jeopardized. The profession must now decide once and for all whether it will submit to approved society domination or whether it will take

this opportunity of making its freedom sure. If this is ever to be done it must be done now. There should be no doubt about the decision, and it must be shown by immediate action. The only course now open is for the profession to show that no service can be secured under the Acts, whatever the exact terms, until the professional position has been re-ectablished. This means that every insurance practitioner should at once send to the secretary of his Panel Committee his resignation from the service, to take effect on January 1st next. If the resignations are so secured by October 30th it will be possible for the Insurance Acts Committee to resume negotiations with confidence, and it may be taken as certain that, the freedom and honour of the profession once secured, there is not likely to be serious difficulty in reconciling the interests of the profession with those of the insured population and of the whole community, which must, of course, be paramount.

The public may be assured—and we believe it is fully assured—that whatever the course of the conflict precipitated by the Ministry of Health may be, members of the medical profession in their individual capacity will not cease to render service to individual patients, whether insured persons or otherwise.

THE WESTMINSTER HOSPITAL.

The Westminster Hospital, which is one of the landmarks of London, is about to be rejuvenated. The hospital grew out of a small infirmary established in 1719. The present site was acquired from the Treasury in 1830, and the building erected upon it by voluntary subscriptions was opened in 1834. The cost of the work now in progress is estimated to be £70,000, of which amount £20,000 has been promised; an appeal is being launched this week for the remaining £50,000. The object is to reorganize the wards, supply modern accessories, provide a home for the nurses, and generally to bring the services up to date. No appeal for such purposes has been made by this hospital within the last fifty years. Before the war a proposal was made to remove the hospital to Clapham; apart, however, from the objection of breaking old associations the comparative cost proved to be the decisive factor. It was found that to construct a new hospital would mean a vastly larger expenditure of money under present conditions than could be obtained by the sale of the site at Westminster. Consequently a few months ago it was decided to carry out the alterations indicated and the hospital was closed last July. It is hoped, however, that it may be reopened in March. Meanwhile out-patients are being treated in Caxton Street, where the medical school of the hospital is situated. Mr. W. G. Spencer, senior surgeon to the hospital, has written for the hospital magazine a history of the hospital and its medical school. Reference to the medical school in the minutes of two centuries does not actually occur until 1834, when allusion is made to a private purchase of a site in Dean Street (now Great Smith Street) at a cost of between £2,000 and £3,000. This school was maintained for a period without formal recognition by the governors. There are accounts later on of undertakings more or less officially backed, but not until 1885, when the existing premises in Caxton Street were opened, does the operation of the school play a prominent part in the life of the hospital. The records of successive members of the medical staff include the names of five who in turn held the position of President of the College of Surgeons. Amongst the early physicians were Benjamin Hoadley, who gave the Goulstonian lectures in 1737, was Harveian Orator in 1742, and was physician to the King's household and to the Prince of Wales; Sir Richard Jebb, physician from 1751 to 1762, who was Harveian Orator in 1774, attended George III, and left behind him many stories of his eccentricities; and Hamilton Roe, another Harveian Orator, who had much to do with the founding of the medical school. The beginnings of the nursing staff were humble. Mrs. Jane Allen, the first matron appointed, at Christmas in 1719, to take charge of the small house in Petty France in which the first infirmary was conducted, was paid £6 per annum, and had the assistance of one nurse at £5 14s. and a maidservant at £4. In addition an old woman visited out-patients, and there was an indoor messenger youth. The number of in-patients varied from eight to twelve, and there were about as many out-patients. The first mention of the employment of a night nurse occurs in 1733. The hospital is now one of the institutions of London, drawing many patients from the poor district between the Abbey and Vauxhall Bridge, and from a still wider field. Its medical school has educated many men who are now practising in all parts of the British Empire. During last year the number of in-patients was, in round numbers, 2,500.

THE AIR AMBULANCE IN WAR.

In his presidential address to the War Section of the Royal Society of Medicine on October 8th, Air Commodore D. Munro discussed the possible uses of the aeroplane in the medical services in future warfare. The history of the air ambulance, he said, began necessarily with improvisations, by which he meant the temporary use of an ordinary service aeroplane to carry sick and wounded, either with no special arrangements at all or only primitive ones, or with a special kind of stretcher adapted to the machine, or a special adaptation of the machine to take the ordinary stretcher. During the retreat of the Serbian Army in 1915 the French made some arrangements for air convoy of wounded. At the end of 1920 the French in the Levant organized an air ambulance in which eighty cases were carried to hospital during a period of four months. For this purpose the machine guns were removed from aeroplanes and the patients strapped in their place. In May, 1923, during an epidemic of dysentery among the British forces in Kurdistan, 198 cases were conveyed by air to Baghdad. The distance was 100 miles as the machine flies, and was much longer by mountain track, which would have had to be taken had the aeroplanes not been available. The operation was difficult owing to bad weather and the lack of suitable landing places, but it was carried out quite successfully in 98 flights; the time occupied in the evacuation was 128 hours 45 minutes. Unfortunately the only aeroplane specially designed for this work had to make a forced landing and was put out of action, so that the task was completed by improvised machines. The special kind of stretcher used with the service aeroplane was of a naval pattern, adapted to aeroplane purposes by the use of an extra lining. It consisted of bamboo sticks in canvas, with a head cushion, a blanket cloak, and a head and face mask. The squadrons in Egypt and Iraq were now supplied with these stretchers for use in emergencies. They were strapped on to the fuselage, and the machine-gun fitting was used for fixing in position. If necessary two patients could be carried in the one machine. The adaptation of the aeroplane itself to accommodate the ordinary stretcher was carried out during the Somaliland expedition of 1919-20, when a machine, known among the troops as the "blood-wagon," was altered so as to take one stretcher and an attendant. The French in Syria and in Morocco had a regular service of such adapted machines, and it was reported to the French Colonial Congress of Public Health in 1922 that in the former country 105 casualties and in the latter country 168 had up to then been conveyed in this manner without mishap. In 1921 the

French Minister of War put into commission a type of machine which carried two stretcher cases, a doctor, and a nurse, and had a roomy cabin where emergency operations could be performed, for which apparatus and equipment were installed. In the British designs there was no provision for the performance of operations, but chief attention was paid to suitable seating accommodation. In the Vickers-Vernon aeroplane two stretchers were run in on rails through the nose of the machine, and there was provision for seating eight patients on deck chairs arranged along the inner wall of the fuselage. There was provision also for an ice- and food-box, sanitary conveniences, and an electric kettle and sterilizer. The machine was well ventilated, smooth running, and the engine note not disagreeable. There were three of these machines at present established, and the number was being increased; another type was in building, to take two stretchers, and to be specially suitable for going out to the scene of a crash in such a country as Mesopotamia. In future these air ambulances would have their own medical personnel, and mechanics and pilots would be told off for them. In warfare it would be possible to form aerial convoys for use between the front and the base hospital, and the method would suggest itself particularly for the bringing in quickly of abdominal and head casualties.

THE QUAKER ABROAD.

TORTOLA, one of the Virgin Islands, derives its name from the brown-coloured turtle doves that make their home on its rocky hillsides; on it, from 1741 to 1786, there were other peace-loving colonists in the shape of settlers belonging to the Society of Friends. Mr. C. F. Jenkins, a well known Philadelphia Friend, has made it a labour of love to collate all available material bearing on these ancient worthies, and the result is a very interesting little book.[1] For the medical historian Tortola has the lure that here (or at least on the islet Little Jost Van Dykes, reckoned as a part of the larger island) was born in 1744 Dr. John Coakley Lettsom, who became later known to fame as the distinguished London physician and founder of the Medical Society of London. He was "dressed plainly and simply after the manner of Friends of the day, and was formally received by the King on more than one occasion, without the required court dress or sword. . . . His many activities gave him little time for Quaker activities, yet he always regarded himself as a member. 'I was born a Quaker,' he tells a correspondent, 'and what is still more strange I was born so within the Tropics.' Eleven years before his death he said, 'I am no bigot, even thinking as well of other religions and sects as I do of that in which I was born and now remain—as I believe, the only Quaker in the world a *West Indian*.'" He is said to have been one of the seventh pair of boy twins born to his mother, of which number he and his brother Edward were the sole survivors. Sent home as a boy of six, he only once revisited the island (in 1767), to take over his father's estate, and one of his first acts was to free all the slaves he had inherited. His youngest son, Pickering Lettsom, was named after John Pickering, the Quaker governor of Tortola. Pickering was eventually superseded during the war with Spain because, with other Friends, he would not "engage an enemy or use offensive weapons." The younger Lettsom settled on the island and practised his profession as a lawyer there. Dr. Lettsom is buried in Bunhill Fields Friends' Burying Ground, with George Fox and Edward Burrough. Another medical Tortolian was Dr. William Thornton, a son of one of the active early members of the Tortola meeting. He was sent to England for education, became a druggist's clerk at Ulverston, and studied medicine, like Lettsom (whose friend and warm admirer he became), at Edinburgh. After completing his studies he returned to Tortola, and succeeded to an ample fortune; later he went to Philadelphia, where he was fired with a desire to repatriate personally the free blacks of the North, as well as the seventy slaves who had come to him by inheritance at Tortola. One or more ill fated expeditions had already sailed with this object from England to Sierra Leone, and Dr. Lettsom dissuaded him from the venture, so Thornton remained in New England furthering his repatriation plans from Philadelphia. Here he married, and, having considerable—although entirely untrained—skill as an architect, produced, in a competition, the winning plan of a new building for the Philadelphia Library which Franklin had founded some years before. This building still stands, though used for other purposes. After a time he returned to Tortola, and practised for a considerable period as a physician. In 1792, while still there, an advertisement by Thomas Jefferson, Secretary of State, for plans for the President's house and for the Capitol drew Thornton again to Philadelphia to submit his designs. Although he was late and the competition closed, none of the fourteen plans submitted had proved satisfactory. President Washington, on seeing and admiring Thornton's drawings, got the Commissioners to accept them, and the Capitol building, "probably the best known and most imposing structure in America," was erected substantially from his design. Thornton became the friend of Washington, was made one of the three commissioners for building the city, and in 1802 was appointed first Commissioner of Patents, which post he held till his death in 1828. He was organizer of this important branch of Governmental work, and "other beautiful buildings in Washington still stand to testify to his taste and untaught architectural genius."

[1] *Tortola: A Quaker Experiment of Long Ago in the Tropics.* By Charles F. Jenkins of Philadelphia. London: Friends' Book Shop. 1923 (Demy 8vo, pp. vi+106; 8 plates. 5s., post free.)

THE LAY PRESS AND SCIENTIFIC RESEARCH.

POPULAR interest in scientific research has increased of recent years, but there has been too little understanding of the true aims of medical and scientific research. Well meaning individuals have thus been led to offer prizes for results in certain researches as if they were competitions of the type at present prevalent in this country, in which thousands of persons make wild guesses and one wins several thousand pounds. This misunderstanding has been fostered by a regrettable tendency in some quarters to create newspaper "stunts" when scientific researches have been published by their authors, often not so much as final achievements but as signposts to fellow workers. It is refreshing, therefore, to find in the October number of that old-established "family" magazine, the *Sunday at Home*, an article dealing with the aims of scientific research in a manner that is picturesque and interesting, and at the same time accurate and discerning. The author, Mr. Harry Cooper, tells the proud story of the men who have given their lives in the pursuit of knowledge and the service of mankind. On his roll of fame are the names of Arthur William Bacot and H. T. Ricketts, who died of typhus, Jesse W. Lazear, who died of yellow fever, MacTier Pirrie, who died of kala-azar—all diseases contracted in the course of research work. The martyrs of the x rays of whom Mr. Cooper tells include Arthur Henry Blacker, C. R. C. Lyster, Ironside Bruce, Clarence Dally, Mihran Kassabian, and other workers still alive though mutilated. Nor does the author forget the heroes of earlier ages—Giordano Bruno, Galileo, Lavoisier, Roger Bacon, Tycho Brahe, Lebon. He proclaims, however, that the strain of chivalry has not died out. "Some of the men to-day who are peering into microscopes or examining the images on fluorescent

screens or experimenting with incubators and agglutination baths, and afterwards reading modest papers before scientific societies, belong to the same breed as those in all generations who have subdued kingdoms, and wrought righteousness, and obtained promises, and stopped the mouths of lions, and quenched the violence of fire. They, too, have been content to die, many of them, not having received the promises, but having seen them afar off." A magazine article written in this sympathetic tone may act as a valuable corrective to the misunderstandings that arise from the somewhat hysterical accounts of medical researches that are published from time to time in other lay journals.

TENDENCIES OF PHYSIOLOGICAL SCIENCE.

Professor A. V. Hill, F.R.S., the newly appointed Jodrell professor of physiology at University College, London, delivered a lecture on October 16th on the present tendencies and future compass of physiological science. He said that physiology in Great Britain, though not in some other countries, was in the faculty of science as well as in the faculty of medicine, and to this he attributed much of its present high standing. It was not true that physiology was the handmaid of medicine any more than that physics was the handmaid of chemistry. Physiology, fundamentally the study of how the living creature worked, had its own needs and problems and methods; at the same time it was true that the utility of its results was largely in the field of medicine, to the needs of which no physiologist could be indifferent. The present tendencies of physiology were in some directions obvious. The unparalleled advances of biochemistry in recent years left no doubt as to one such tendency. Biochemistry was now passing beyond the study of the structure of matter that had been alive to the study of occurrences in the living cell. It would play a great part in the solution of such problems as the chemical nature of insulin, and perhaps its synthesis, the mechanism of immunity, and the elucidation of the accessory food factors. Differing from biochemistry only in technique and not in purpose was the development and adaptation of purely physical methods, including the design of instruments, of which he instanced the latest form of Einthoven galvanometer as representing the highest effort of the creative imagination. Along this road the effect of x rays on living cells, the mechanism by which work was produced by the expenditure of chemical energy in the muscle, and the further study of the action of physical factors such as light, heat, and touch on the sense organs, awaited the investigator. The cautious application of the experimental method must continue to make for progress. The analysis of the living nervous system, the pancreatic, endocrine, cardiac, and other functions, all required experiments on animals. Now that the discovery of insulin had appeared as the result of animal experiment it seemed unlikely that there would be any immediate interference with experimental freedom, but in a few years' time, when insulin had become accepted as part of the medical armoury, the public might not remember the means by which it was elicited, and some apparently innocent legislation might be hurried through which would make further advance impossible. But it was strange how often a physiological truth, discovered in an animal, needed to be amplified by working it out on man. Man had proved to be the best subject in studying, for example, respiration and the carriage of gases by the blood. Moreover, experiment on man had the advantage that it led directly to what was required in medicine. Until the truth discovered in animals had been applied to man it had not, so to speak, attained its majority. It was necessary to build up a sound body of trained opinion versed in study on man, which would prove of great service, not only in medicine, but in many directions in social and industrial life. The physiology of the future would take more advantage of zoology. This might not enter into the sphere of medical science, but it was physiology none the less. Zoology, of which physiologists had often been ignorant, had to offer in its greater elasticity of technique a new armoury of weapons, and perhaps its study might help to correct the tendency of some physiologists to forget the existence of the animal as a single organized whole. Histology, hitherto associated with physiology, might with advantage be surrendered to anatomy, to which it logically and properly belonged. The new physiologist was apt to be too busy with other things to bestow sufficient care upon histology, while the new anatomist, unlike his forerunner, had more interest in the investigation of the living body than in the dissection of the dead, and one of his natural methods of attack would be the microscopical study of the web structure of living tissue. Physiology was nothing less than the study of the mechanism of life in any form and by every means which science or the arts had to offer. Team work would have to be undertaken and organized investigations planned, but the opportunity must remain for that free and unfettered originality which the older and less businesslike methods so richly evoked. More than ever freedom would be needed, the liberty to investigate things because they were interesting, because inquiry into them was an adventure of the human spirit, because they seemed to lead to a solution of those fundamental problems which man in his intellectual impudence believed to be soluble. Professor E. H. Starling, who presided at the lecture, referred to his successor in the Jodrell professorship as the most distinguished physiologist of the new generation in this country. When he himself was considering whether he should apply for the Foulerton professorship of the Royal Society and resign his post at the mother school of English physiology, he felt much disinclined to give up the direction of the institute, and then he remembered that if he did they could get Hill! For many years physiology did not represent a separate discipline at all; only comparatively recently had it been separated from anatomy. It had derived great illumination from the labours of chemists and physicists, and chemists themselves had come into its fold, but the special feature of the present occasion was that physiology could welcome as its "convert" a man who began as mathematician and physicist.

SMALL-POX AND VACCINATION.

The publication by the Research Defence Society in the October number of its journal, *The Fight against Disease*, of an address given by Dr. John C. McVail to members of Parliament last July on small-pox and vaccination, provides an interesting statement which will be very helpful to any who are concerned with the education of the general public in this important matter. The value of the prevention of small-pox is illustrated particularly by the register of Kilmarnock in Ayrshire, which includes the causes of all deaths there between the years 1728 and 1764, during which period there occurred nine epidemics of small-pox; the inevitability of infection and the high death rate before the age of Jenner are apparent. The prevention of the disease by vaccination is set out and supported by evidence drawn from the conditions in Germany before and during the last war; furthermore, the importance of revaccination is clearly indicated in a table of incidence rates in four cities which are well known as centres of antivaccination activities, and also in another table of incidence of the disease in Glasgow during the epidemic of 1900-1. The impossibility of prevention without vaccination is succinctly demonstrated, and, although

the value of improved sanitation is admitted, its limitations, regarded as a preventive agency, are clearly brought out. The safety of properly conducted vaccination is made manifest. A note on the working of the Vaccination Acts is included, and a hitherto unpublished incident of Sir H. M. Stanley's last expedition to Central Africa, which has a considerable evidential value, is related. This address is of especial value at the present time, when a simple but effective statement is required of the solid basis of fact on which the case for vaccination rests; the fanciful assertions of the antivaccination propaganda can be combated decisively with its aid. The Research Defence Society has again merited the gratitude of the medical profession generally for a timely and valuable publication which should be widely circulated. Its simplicity of language and clearness of argument enable it to be understood and appreciated by the average layman, whom it should interest and convince. The medical practitioner will also find in it some valuable weapons against the opposition of the antivaccination partisans. Its brevity and excellent paragraphing will enable him to assimilate rapidly the considerable amount of evidence which is comprised in it. We are glad to be able to add that its author has consented to revise the British Medical Association's pamphlet *Small-pox and Vaccination*, which has been for some time out of print.

INTERNATIONAL CLINIC OF PLASTIC SURGERY.

A GAP in the practice and teaching of plastic surgery is to be filled by the establishment of an international clinic in association with St. Andrew's Hospital, Dollis Hill, London, N. A portion of the existing building will be used until funds are available to build another wing to the hospital devoted entirely to the reception of cases requiring plastic operations. The clinic vindicates the word "international" in its title by the constitution of its staff, which consists of Mr. H. D. Gillies and Mr. T. Pomfret Kilner (Great Britain) Dr. J. Eastman Sheehan and Dr. Ferris N. Smith (America), and Professor Lemaitre (France). This, it is hoped, will ensure that a knowledge of the best methods of foreign specialists will be made generally available to British and foreign surgeons, for whom post-graduate courses will be arranged. It is estimated that a sum of about £25,000 in all will be required. Donations, made payable to "The International Clinic of Plastic Surgery," will be received by the London Joint City and Midland Bank, 69, Pall Mall, London, S.W.1. Accommodation will be provided for both paying and free patients; the latter will be charged only the cost of their maintenance while in hospital.

A FURTHER announcement regarding the Council Dinner of the British Medical Association, on Wednesday next, October 24th, appears in the SUPPLEMENT at page 174. Members of the Association wishing to attend should apply at once for tickets (price 10s. 6d. each, exclusive of wine) to the Financial Secretary, 429, Strand, W.C.2.

THE Honorary Fellowship of the American College of Surgeons is to be conferred upon Sir William Wheeler, President of the Royal College of Surgeons in Ireland, at the convocation ceremony in Chicago on October 26th. Sir William Wheeler left for America last week, having accepted an invitation of the Regents of the American College of Surgeons to deliver the Fellowship Address on this occasion.

OWING to the great pressure on our space, due to the insurance crisis, the Epitome of Current Medical Literature is held over this week.

CARDIAC CLINICS.

THE discussion on the etiology and treatment of heart disease in early life in the Section of Medicine at Portsmouth is published at page 702, and the situation is reviewed in a leading article on page 723.

The Association for the Prevention and Relief of Heart Disease in New York, which seeks to promote the establishment of cardiac clinics, has recently forwarded us a copy of a statement of what it regards as the minimum requirements for cardiac clinics. Every cardiac clinic, it is considered, should have more or less direct connexion with a ward service, should work in co-operation with agencies providing convalescent and country care, and with social service work in the district from which it draws its patients. Further, it is thought advisable that a clinic should co-operate with schools, day nurseries, and the like in its district, and furnish reports on the diagnosis and treatment of the children coming under its care. The hospital wards would be available for the initial study of each case and for the treatment of those patients unable or too ill to receive proper care at home; the cardiac clinic would also treat patients after they left the wards. The following is the text of the statement on the minimum requirements:

MINIMUM REQUIREMENTS FOR CARDIAC CLINICS (NEW YORK).

I. *Medical Organization.*

Chief of Clinic: The chief of clinic must be a physician of sufficient experience with patients having heart disease to meet the approval of the Executive Committee of the Association.

Staff: There must be at least one physician for every fifty active patients enrolled in the clinic.

Ward Facilities: There must be at least an affiliation with a ward service where cardiac cases may be admitted.

II. *Social Service.*

There shall be at least one social service worker connected with the clinic.

III. *Space Equipment and Facilities.*

1. There shall be at least one waiting-room and separate rooms or cubicles for the examination of men and women patients in adult clinics.

2. There shall be an examining table in each room, at least one pair of scales, and a sphygmomanometer in the clinic.

IV. *Records.*

Records of patients, history, physical examination, treatment, and follow-up notes, including social service activities, must be kept in a manner meeting the approval of the Association. These must be filed in such a way as to be easy of access.

V. *Admission and Distribution of Patients.*

Only patients having potential or organic heart disease shall be enrolled. No patient shall be carried on the active list of a clinic who has not reported in six months.

VI. *Standards for Physical Examination.*

A. Each patient should have a complete physical examination on admission and receive such examination as is necessary on subsequent visits.

B. All doubtful or unusual cases should be seen by the chief of clinic or consulting physician.

VII. *Standard for Treatment.*

A. *Relation to Public School System.*—The clinic should co-operate with the schools, social agencies, and day nurseries, etc., by the diagnosis and treatment of referred cases. It is desirable that cases should be referred only from a specified district mutually agreed upon, and that, so far as possible, cases should be referred by appointment in such numbers and at such hours as may be of greatest mutual benefit.

B. *Convalescent or Country Care.*—Close co-operation should be maintained with the agencies providing convalescent and country care.

C. *Consultation Facilities.*—There should be facilities for consultation in all required specialties.

D. *Amount of Medicine.*—The amount of medicine dispensed should be sufficient to obviate the return of patients for medicine only.

For purposes of classification patients attending the clinics are divided into three main groups:

1. Organic heart disease.
2. Patients with abnormal signs or symptoms, not believed to be due to organic disease.
3. Potential disease—patients without circulatory disease but who are kept under observation because of the presence or history of an etiological factor.

For the complete diagnosis of organic cases, the disease has to be classified under four different titles, according to

its (1) etiology (nine titles given); (2) structure (twenty-nine titles given); (3) pathological physiology (twelve titles given); (4) functional capacity (four titles given). Thus a diagnosis might read: (1) rheumatic inactive; (2) mitral stenosis; (3) auricular fibrillation; (4) Class 3, much impaired activity; or (1) syphilitic, active; (2) aneurysm of aorta; (3) normal sinus rhythm; (4) Class 4, confined to bed.

The address of the Association for the Prevention and Relief of Heart Disease is 370, 7th Avenue, New York. The chairman of the Committee on Cardiac Clinics is Dr. William St. Lawrence.

PUBLIC HEALTH IN SOVIET RUSSIA.

BY

L. HADEN GUEST, *M.C.*, M.R.C.S.

(Continued from p. 679.)

II.—The Conditions of Child Life.

The original intention of the Communist party in Russia was to apply a full programme of Communism in all departments of life. This, of course, included the children, about whom the Communists agree with Plato that they are the business of the State and not of the individual. Translated into action this meant the setting up of a large number of "children's homes" all over Russia, where the children were to live a communal life and be provided by the State with all the requirements of life. In practice the plan has not worked out so well as intended—the cumbrous organism of Russian bureaucracy could not adapt itself to new conditions—and the children in 1920, 1921, and 1922 lacked not only clothing and materials necessary for education, such as books, pencils, and paper, but, most important of all, they lacked food. In September, 1922, there were not less than 300,000 children on the verge of death from starvation. Foreign relief, Government activity, and the revival of free trade inside the country averted the worst of the evil, but the suffering of many children, in and out of the children's homes, was excessive. Many died, and a very large number were permanently injured. A good authority informed me that "all the children of the revolution"—that is, all children who were either very young in 1917 or have been born since that date—"are neurasthenic—interesting, but neurasthenic." But apart from this neurasthenia the effects of deficient feeding, of rickets, and of intestinal disorders caused by bad food, have left the mark of permanent injury on a great number of children. This injury may be compensated for by later developments, but it cannot be entirely obliterated.

Among the effects of this lower standard of life in 1922 must be counted the almost universal occurrence of scabies, tinea tonsurans, and eczema. There are also a very large number of cases of favus, and eye diseases are widely spread. Pediculosis is not to be mentioned, because it was practically universal in child and adult, as the typhus statistics showed.

The situation has had to be met by applying medical knowledge in a State-directed campaign which is already producing marked results. To begin with, certain difficulties and certain practical impossibilities have had to be recognized. In the first place, while I was not explicitly so informed, the principle of the communal children's home has apparently been abandoned, for it is stated that the number of children in such homes is now only 120,000, or less than half the child population of Moscow, and these children are spread all over Russia.

It was the original intention of the Government that all children attending schools, whether in a children's home or living with their parents, should be provided with clothing and food at the expense of the State. This plan has had to be given up, and neither clothing nor food is ordinarily so supplied.

There is the further difficulty of staffing a sufficient number of schools with teachers. Russia was extremely deficient in all trained personnel before the war—the Czarist Government being quite definitely opposed to the education of the masses—and the events of the revolution and civil war since then have made systematic training very difficult. The difficulty is complicated by the Government's policy of secular education, as a number of teachers refuse to teach unless they are allowed to give religious instruction, and in the villages the peasants, who are very superstitious, refuse to pay for education unless they are allowed to have a priest to teach their children. This conflict is not settled or likely to be settled for some time, and it will certainly have injurious effects upon education.

The actual lack of personnel and the further lack of institutions make it impossible for the Government at present to deal with the many abandoned children, orphans and others, who have collected around all the large towns in Russia during the period of war, civil war, revolution, and famine. The very large mass movements of population which have occurred have inevitably led to the formation of this strange and sinister class of wild human beings. It is estimated that there are four or five thousand of these children in Moscow itself. They live in the woods around the town, and employ themselves in selling, in begging, and in sheer vagrancy. At night they flock into the large railway stations to sleep. Numbers of quite young girls are to be seen in the streets, selling scent and other trifles, and they stay there very late at night. Some of them are becoming prostitutes at a very early age. All of these abandoned children are growing up without control and without schooling, and they will be a very serious problem indeed in the future.

The number of tuberculous and syphilitic children in Russia is unfortunately very considerable, but these are now being separated from normal children and dealt with in special institutions. Leprosy is also common in Russia, and children affected with leprosy or the children of lepers are now separated from the others. A mere enumeration of these problems shows the tremendous problems Russia has to tackle, but, although her technical equipment of personnel and of institutions is less than normal, a great measure of success is being attained. The Russian medical service is, of course, a very good one, and it has worked extraordinarily well, but it is certainly to be hoped that it will now get assistance from other countries in work which, after all, affects other countries materially, especially those which come directly into contact with the Russian frontiers.

The measures mentioned up to the present are mainly negative in character, but it required great courage to take negative measures in a country so enthusiastic for its own Marxist ideology. But practical constructive steps have been taken as well. At present a considerable number of children are receiving food from relief agencies of one kind and another. Meals paid for by money which comes from the Pope are at present nourishing 6,000; it is not a very large meal, but one containing sugar, milk, and fat, and a very large number of all town children are provided for in summer in the country by a State-organized system of camps or colonies. The children live in the sunny climate almost completely exposed to the air, the clothing of both boys and girls being usually only a small pair of drawers. In the climate of Russia this is sufficient clothing in summer.

For the treatment of skin diseases the Commissariat of Health is now proposing to set up *x*-ray installations in the Crimea, at Moscow, and at Kharkov for the Ukraine.

It is quite obvious under the conditions just indicated that school medical inspections such as are carried out in Great Britain are, if not impossible, at least very difficult. But there is a medical service engaged in the work. There are about forty school doctors in Moscow, of which the school population is about 300,000, and there are special school doctors in other large towns. In the villages the doctors responsible for the medical care of the district have been instructed also to inspect the children in the schools. Gradually, therefore, as the preliminary classification and segregation of well and diseased children is carried out, it will be possible to proceed to the treatment and care of the ordinary ailments of school life, such as are dealt with in England and Germany. Under existing conditions, however, it is not practicable for the methods used in England and Germany to be carried out in Russia for a considerable number of years to come. For one thing, a large increase in the number of doctors will be required, and as the

deficiency in trained personnel is not less but rather more marked in the medical profession than in any other (partly owing to the large number of deaths of doctors from typhus fever); it is certain that the addition to the number of doctors cannot be very rapid. But the Universities of Moscow, Petrograd, and other places are working; students are studying and qualifying, and the Commissariat of Health is endeavouring to obtain the co-operation of professors and teachers from other countries in their university, and more especially in their post-graduate, work. Above all, the great successes already obtained by the State medical service in dealing with the epidemic situation compel one to acknowledge that although the problems to be faced in Russia are gigantic and terrible, yet the medical service has shown itself able to solve them. We may therefore anticipate that, great as are the numbers of children to be dealt with, the medical service will bring order into this region of its work as it has brought the epidemics under control. The first tasks are now being undertaken—the separation of the gravely diseased from the normal—and when these are completed we may be sure that the capacity for facing realities which has marked the whole Russian régime will turn the attention of the Commissariat of Health into lines of activity parallel with those of England and Germany.

Scotland.

Chair of Surgery in Edinburgh.

Professor Alexis Thomson, C.M.G., has retired from the Chair of Systematic Surgery in Edinburgh University and will not lecture in the session that is now beginning. Some delay may ensue in the appointment of a successor, as discussion has taken place regarding the conditions upon which the next occupant of the chair may be appointed. Sufficient funds are available to appoint a whole-time professor of this subject at a salary of £2,000 a year, who would be debarred from outside practice. Considerable doubt has, however, been expressed in some quarters whether such a departure from the existing conditions of this professorship would be desirable at the present time. The University authorities may decide not to avail themselves of the money available for this purpose, and to continue the chair on the part-time basis upon which it has been held since its institution in 1831.

Centenary Morison Lectures in Edinburgh.

This year marks the centenary of the Morison Lectures in the Royal College of Physicians at Edinburgh, the first lecture having been delivered by Dr. Alexander Morison on November 21st, 1823. The first of the three lectures for the present year was delivered on Monday, October 15th, in the Hall of the Royal College of Physicians, by Dr. Alexander Blackhall-Morison. Sir Robert Philip, President of the College of Physicians, occupied the chair, and, in introducing the lecturer, mentioned that he was the grandson of the founder of the lectureship; Dr. Alexander Morison in the early years of the nineteenth century had devoted himself to the study of mental diseases, and had been a physician to the Bethlem Hospital and other institutions intended for the care of the insane. He gave his first lecture in Edinburgh in 1823, he died in 1864, leaving to the College the house and lands of Larchgrove, Midlothian, to found this lectureship. A course of lectures on mental diseases had been delivered annually since that time; in 1896 the subject had been broadened, so that the course might include neurology as well. Dr. Blackhall-Morison's first lecture was devoted to an historical review of the progress of neurology during the hundred years since 1823. The first Morison lecturer had been Dr. William Seller, who had written a valuable memoir upon Robert Whytt, an eighteenth-century professor of medicine in Edinburgh. Whytt's essay on the vital and involuntary motions of animals had been a most important contribution to the early knowledge of neurology, and his doctrines of sympathetic action had successfully replaced the animistic doctrines of Stahl and the theories of von Haller as to organic action. The advances in embryology made by von Baer, von Kölliker, and others, had had a very important influence in elucidating the development, and thus indirectly the functions, of the nervous system. Bichat, at the end of the eighteenth century had taught that the voluntary and sympathetic systems were completely independent, an advance in its time but now shown to be untenable in its entirety. The theories of Gall and Spurzheim had at least the advantage of drawing attention to the question of localization of function in definite parts of the nervous system. The first great step in differentiation of function of different parts was the discovery by Charles Bell in 1811 that the anterior spinal roots were motor and the partial discovery of the functions of the posterior roots, which was followed eleven years later by the complete demonstration of their functions by Magendie. To Gaskell physiology owed the greater part of the knowledge regarding the paths of voluntary and involuntary impulses respectively through the spinal cord, though the rami communicantes had been discovered by Haller. It was a curious point that the decussation of the motor tracts in the medulla which had been well known to the ancients and described by Aretaeus in the first century had been forgotten and had to be rediscovered in the nineteenth century. The discovery of reflex action by Marshall Hall in 1832 was a most important advance. The name of Flourens was still associated with the localization of the breathing centre (1837), to which he gave the name *nœud vital;* successive steps in further localization had been made by Schiff, Fritsch, Hitzig, Ferrier, and others. In clinical neurology one of the earliest names to be remembered was that of Tod, who described the connexion of the symptoms with the pathological changes in locomotor ataxia, as this disease was later named by Duchenne. The name of Charcot was specially connected with the discovery and description of disseminated sclerosis and with the elucidation of various functional conditions. Finally, the brilliant results which had been attained towards the latter part of the century by neurological surgery were bound up with the name of Horsley more than any other.

Ireland.

New Water Scheme for Belfast.

On October 10th Lord Carson cut the first sod of the new water scheme for Belfast. In dry summers the amount has not been sufficient, and the hours of supply have been very seriously limited. The new scheme has been in contemplation for years, but was delayed by natural difficulties and by the war; it will take some seven years to complete, and will cost about a million sterling. An artificial lake will be formed in the Silent Valley in the Mourne Mountains, by constructing a huge dam across its mouth. When the undertaking is completed a supply of some thirty million gallons a day of the purest water will be available.

Royal Medical Benevolent Fund Society of Ireland.

The eighty-first annual report of the Royal Medical Benevolent Fund Society of Ireland states that, despite the many general and local difficulties they have had to meet, the honorary secretaries and treasurers in practically all the counties of Ireland have maintained their support and in many cases actually sent in an increased subscription; most thanks are due to those gentlemen who have not only subscribed liberally themselves but have given up their time to further the interests of the Society, and so to help their colleagues who have met with misfortune, and the widows and orphans of those who have passed away.

Dividends and interest show an increase of £67 odd this year. The donations include the legacy of £2,000 left by the late Mr. Musgrave of Belfast, which has been invested, and £200 from the Carmichael Fund, also a donation of £10 from Dr. C. Holmes Denham, who has been elected as a life member. The revenue from all sources for the year, including the donations, is £3,549. The actual subscriptions show a decrease of £53 odd, being £540 as compared with £593 last year. The greater part of this decrease represents subscriptions from the various Dublin hospital students not received in time for audit. There is also a further amount of £277 income tax refund still outstanding.

Work of the Irish Benevolent Fund.

The Committee draws special attention to the amount of grants disbursed during the year—namely, £1,695 as compared with £1,215 last year, an increase of almost £500. The Osborne account shows a debit balance of £207, which has been advanced from the General Fund. The Committee thanks the British Medical Association for receiving subscriptions for this Fund amounting to £25 13s. 6d. The Central Committee places the following facts before its non-subscribing colleagues:

That the Society is a purely Irish one, administered by Irish medical men for the benefit of the widows and orphans of Irish medical men who have practised in the country. That the Central Committee in allotting grants rely upon the recommendation of the various honorary secretaries and subscribing colleagues who have local knowledge of each case, and the amount of relief given entirely depends upon the needs of the applicant and the available funds. That help given to those in distress is given promptly and is as much as the resources of the Society permit. That the number of non-subscribers receiving benefits amounts to 40 as compared with 41 subscribers. That the Central Committee have this year given £500 more than last year in grants on account of the great distress due to higher cost of living, that the bank balance at the moment is only £888 12s. 1d., and that even to continue the work next year £1,200 must be raised or the relief must stop.

The Central Committee appeal most earnestly to their non-subscribing colleagues throughout Ireland to consider the claims that this charity has upon them and to help by an annual subscription, however small. Seventy-five per cent. of the medical profession, in spite of appeals, does not subscribe, and so leaves the charity dependent upon the generosity of their colleagues, past and present. There are over 3,000 practitioners in Ireland, and 10s. from each would place this Society on a sound financial basis, and would so enlarge the grants allotted that relief to the distressed would be possible.

The report shows that the medical practitioners in Belfast and Dublin have, apart from their advantage in numbers, been the most liberal subscribers to the fund. The medical practitioners in the cities of Cork and Limerick have also done very well. Wexford has done the best of the counties; this county, in the matter of public subscriptions for medical objects, is indeed an example to all the boroughs and counties in Ireland. The grants from the fund are almost entirely made to the widows and orphans of the medical men who served in the Irish Poor Law medical services. This fact should, in many cases, be more generally appreciated by Poor Law doctors than is the case.

Presentation to a Dispensary Doctor.

On October 3rd, at Bannfield, Coleraine, Dr. J. T. Creery, medical officer of the Coleraine dispensary district, and medical officer of health for the urban district, was presented by his numerous friends with a new motor car, fitted with every convenience, as a recognition of his life-long services to the community, and their gratitude for his unwearying labours and high professional skill, ever available for both rich and poor. Dr. H. S. Morrison, D.L., M.P., bore testimony on behalf of the medical profession to the high esteem in which Dr. Creery was held in their ranks, and to the gladness with which they joined in doing honour to one who had done so much for others. Dr. Creery has been medical officer in Coleraine for over forty years

England and Wales.

Health Propaganda in Yorkshire.

In connexion with the health propaganda that was carried on throughout the country during "National Health Week" from October 7th to 13th, a joint committee was appointed by the County Council and the Insurance Committee of the West Riding of Yorkshire. This, under the direction of the medical officer of health, Dr. J. R. Kaye, was very successful in bringing together in prominent association the curative and preventive sides of medicine. Addresses were delivered to school children by 142 medical practitioners in the West Riding, and where it was impossible for a medical practitioner to give an address it was delivered by the head master of the school. Outline notes for such an address were printed and circularized to those concerned, and "health cards" were distributed to the school children at the conclusion of the addresses, one being a scholar's "health creed" and the other an acrostic on the Health Week motto, "Self-help in health." Over 214,000 of these cards were distributed. Nearly 2,000 circular letters were also sent out to all clergy and ministers of religion in the West Riding, asking that in the course of the sermon to be preached on the Sunday of the week some reference should be made to the subject of health.

Annual Medical Service in Liverpool.

The Bishop of Manchester, Dr. W. Temple, preached the sermon at the annual medical service at St. Luke's Church, Liverpool, on October 14th, before a large congregation. The Lord Mayor and Lady Mayoress attended in state, and the vice-chancellor of the University, Dr. Adami, and many medical men of the city and neighbouring districts in academic robes, were present. The service was conducted by the vicar of St. Luke's, and the lesson was read by the archdeacon. The sermon was based on the meaning of life and the mystery of evil. Four strata might be distinguished, he said—matter, life, mind, and spirit—and these were all correlated. Each stratum required the one above it to reveal and develop its own possibilities, while each of the higher strata needed the lower ones to enable it to exist at all. Evil was merely evil until it had been made the occasion for the moral victory that triumphed over it, and then it became an element in good. The meaning of life was the continual progressive victory of the higher over the lower elements. The healing of men's bodies and the healing of men's souls could not be separated. More and more were we learning how interdependent they were. In devoting itself to the healing art the medical profession was an example to most of those who served in other ways. Through self-forgetfulness and self-dedication the conflict with evil in all its forms rendered man a partaker of the divine nature and co-operator in the activity of God. The offertory was made on behalf of the Royal Medical Benevolent Fund, and amounted to £51 4s. 4d. The honorary treasurer, Dr. J. Ernest Nevins, 32, Princes Avenue, Liverpool, would gratefully acknowledge any further donations from those who were unable to be present at the service.

A new sterilization law was passed by the last session of the legislature of the State of Oregon, U.S.A., setting up a State board of eugenics, comprising the State board of health and the superintendents of the two State hospitals for mental disease, the State institution for the feeble-minded, and the State penitentiary. The superintendents of these institutions are required to report to the board quarterly the cases of all persons who are feeble-minded, insane, epileptic, habitual criminals, moral degenerates, and sexual perverts who are likely to become a menace to society. If, in the opinion of the board, the condition of the person is unlikely to improve and procreation would produce children with inherited insane, epileptic, criminal, or degenerate tendencies, the board shall specify the type of sterilization to be performed; the person may select his own surgeon, subject to the approval of the board.

Correspondence.

VITAMINS AND CHLOROPHYLL.

SIR,—May I add a few words to the valuable information contained in a note under the above heading in your issue of October 13th (p. 684)?

During the siege of Kut we had over a thousand cases of fully developed scurvy and several thousands in an incipient stage; all the cases except one were in Indians whose rations were quite different from those of British troops. Our fresh vegetables ran out early, and the vegetable gardens we cultivated provided but a scanty supply for hospitals. All the troops, however, were encouraged to pick the herbs and all greenstuffs that grew on the alluvial plain outside the town and near the trenches. A medical botanist we had with us had previously collected samples of the growing toxic plants; these were on view in every orderly room.

In those days we knew little or nothing of vitamins. The most prominent etiological point brought out in these cases of scurvy was that the disease arose from an absence of fresh vegetable food. Green herbs gathered from the plains had a marvellous effect in keeping down the incidence of the disease. As soon as wild herbs and shrubs and grass sprang up at the end of February, 1916, in sufficient quantity to be collected, cooked, and eaten, scurvy declined, and it did so when there was a marked deficiency of all the proximate principles in the food and the men were on a semi-starvation diet. In the *Medical and Sanitary Report of the Defence of Kut* I stated:

"This effect of green herbs was most conspicuously demonstrated. I had expected that in the last period of the siege we should have many thousands of cases—one had apprehensions of a repetition of what took place among the Russians during the final stage of the defence of Port Arthur. To one's surprise the disease declined, although the men were on a bare subsistence diet for a long time and, during the last six weeks, on a starvation diet, and they were rapidly losing weight; the only change that took place was the addition of from two to three ounces per man per diem of green herbs, collected as stated, to the rations. As to the nature of the anti-scorbutic principle contained in the fresh greenstuffs I am not prepared to express an opinion, but I believe it is contained in all greenstuffs and herbs."

Based on some data given in the report referred to, Miss Harriette Chick and Miss Margaret Hume did some highly valuable work on scurvy and beri-beri and discovered that germinating grain and pulse contain anti-scorbutic vitamins after the grain has sprouted; advantage was taken of this fact in the later stages of the Mesopotamia campaign to use germinating grain as part of the troops' rations to prevent scurvy.—I am, etc.,

P. HEHIR,
Major-General I.M.S. (ret.).

Westward Ho, Devon, Oct. 13th.

INSULIN AND DIURESIS.

SIR,—In connexion with Professor Macleod's statement at the Royal Society of Medicine, that insulin does not always abolish the diuresis of diabetes mellitus even when the glycosuria and hyperglycaemia disappear, it may be interesting to record some points about a diabetic who has been under my observation for nearly four years.

In this case, which was of moderate severity, the patient had habitually no diuresis when the urine contained a trace of sugar and the blood sugar was averaging 0.15 to 0.22 per cent. When he passed much sugar at certain periods and his blood sugar rose to 0.3 per cent. he had a moderate diuresis of 2,000 to 3,000 c.cm. in the twenty-four hours and frequency both by day and night. On the other hand, when on strict diet and aglycosuric with a practically normal blood sugar, he had marked diuresis by day but never at night (3,000 to 5,000 c.cm.). Unfortunately the fluid intake was not measured, but was not excessive as in some diabetics, who drink a great deal from habit, even after becoming aglycosuric. When he started insulin, he had heavy glycosuria, blood sugar of 0.3 to 0.35 per cent. and diuresis both by day and night. During the first few days, when the blood sugar was being reduced to 0.12 to 0.22 per cent., the diuresis was abolished. But it returned very copiously later when he was treated by Graham's method, and had a blood sugar rarely above 0.13 per cent. Since he has increased his carbohydrates again and his fasting blood sugar has risen to 0.17 per cent., the diuresis has again disappeared, but is liable to occur about two to four hours after his morning dose of insulin.

From this case it would appear that the same aglycosuric diuresis can be found with and without insulin and is associated with a low blood sugar content, perhaps lower than the diabetic organism requires. It is noticeable that this patient feels better when the diuresis is absent and the blood sugar slightly high. This raises the question whether the diuresis can be regarded as an indication that this patient is not living at his optimum with a low normal blood sugar.

Pituitrin stopped the diuresis in this case, but failed in another similar one; a moderate amount of alcohol diminished it. Changes in the sodium chloride intake and in the relative proportions of carbohydrate, protein, or fat of the diet had no effect. The explanation of this diuresis is very difficult, but I would suggest that it lies in vaso-motor influences rather than in the usual laws of kidney permeability which govern glycosuric diuresis.

Most of the above sugar estimations were made in the Biochemical Laboratory, King's College Hospital, and I am indebted to Dr. G. A. Harrison for permission to quote them.—I am, etc.,

R. D. LAWRENCE, M.D.

Highgate, Oct. 12th.

BETEL CHEWING AND CANCER.

SIR,—With reference to the letters of Mr. R. L. Spittel and Dr. J. Campbell (BRITISH MEDICAL JOURNAL, October 13th, p. 680), may I be permitted to add some facts relative to the frequency of buccal cancer—apparently due to betel chewing—in Travancore, a native State in the extreme South of India? Mr. A. Fells, now of Bristol, published in the BRITISH MEDICAL JOURNAL (June 6th, 1908) notes on 377 cases of epithelial cancer seen in two years at Neyoor Hospital, the head station of the Medical Mission of the London Missionary Society; 91.5 per cent. of these cases were in the region of the buccal cavity. He also gave an analysis of 209 operations for buccal cancer.

Mr. W. C. Bentall, now of Southport, in the BRITISH MEDICAL JOURNAL (November 7th, 1908) gave an analysis of 1,700 cases of cancer in South India. The incidence of buccal cancer (including that of lips, tongue, and jaws) showed the remarkable percentage of 70.6 of the whole series. He also gave an analysis of 190 cases operated on at Neyoor Hospital.

I have records of 222 cases of buccal cancer, upon which I operated during a period of about seven years, while I was in charge of the same hospital. I have careful notes as to age incidence, site, etc., which I was prevented from publishing by war conditions, but which I shall be glad to furnish to Dr. Leitch.

As has been said by Mr. Spittel, the quid so largely used by Indians consists of areca nut, betel leaf, slaked lime, and tobacco leaf. In Travancore, where so many cases of buccal cancer have been seen and operated upon, the universal custom is to use a tobacco leaf which has been steeped in a thick black syrup prepared from crude sugar. The leaves so treated are spread on mats by the roadside, and soon become a sticky mass—an excellent culture ground for various organisms, I should imagine. I am inclined to agree with Dr. J. Campbell that probably in addition to irritation some infection is necessary for cancer production. In the chewing of such infected tobacco both are provided.

I was surprised to find that among the Brahmin community, who lived in the same parts and who chewed freely, few, if any, cases of buccal cancer were observed; and I was inclined to deduce from this that, as they were strictly vegetarian in their diet, such a diet might have some inhibiting action on cancer growth, as has been repeatedly suggested.

I should like to know whether the quid chewed by the high caste Indian people differs in any material degree from

that so commonly used by the patients we operated on, and who were for the most part not strict vegetarians.

It is practically impossible in the case of a village population, such as one has to deal with in India, to frame anything like accurate statistics. The majority of the patients are not seen again after they leave hospital, but quite a number were seen three to five years after operation, still in good health.

I am glad to record that I saw two cases upon which Mr. Fells had operated for cancer of the lower jaw, the one nineteen, the other eleven years previously. Both were quite free from disease. I also saw a case of total excision of the tongue for cancer, done by the same surgeon eighteen years previously, with no sign of recurrence of disease.—I am, etc.,

Selhurst, S.E.25, Oct. 15th. JAMES DAVIDSON.

SIR,—Similar experience in Travancore to that of Mr. R. L. Spittel in Colombo leads me to corroborate entirely his description and conclusions. The habits of Travancoreans in the matter of betel chewing evidently agree very closely with those of the people of Ceylon, the usual quid consisting primarily of a betel leaf smeared with lime with in most cases some country dried tobacco and a fragment or two of areca nut. The use of the lime-smeared leaf begins commonly in youth, the tobacco being often, I fancy, a little later addition, the habit becoming eventually one almost impossible to be broken, even when its dire local effects begin to be noticed.

Having recently left India after twenty-one years' charge of the Salvation Army hospitals in Travancore I cannot now refer to actual records and statistics, but at the Catherine Booth Hospital of 72 beds in Nagercoil we practically always had a case or two in, and I have sometimes operated on three or four in a week, after having to turn away others as too far advanced even to render justifiable a merely palliative removal to get rid of a foul, painful mass rendering food-taking difficult and life almost insupportable.

As Mr. Spittel says, the almost invariable beginning is leucoplakia of the cheek opposite the molars and pre-molars, and I think more frequently on the left side, which I have noticed to be the more favoured side in practice for the keeping of the quid; the actual growth commences usually at or behind the centre of the leucoplakial patch, so that one may find this appearance reaching practically to the angle of the mouth or further, perhaps an inch in front of the epitheliomatous lump. I should say that the common age at which patients presented themselves was in the late forties and the fifties, but I have seen it in a woman as young as 35, and I think once a little younger. Once formed, the growth tends to spread centrifugally, generally reaching the lower sulcus and then the gum and alveolar process before the upper, and spreading forwards, I think, more rapidly than backwards. After a time it burrows towards the skin surface, finally going on to involve the skin.

The glands are not noticeably involved very early, the first palpable being discrete and mobile, and perhaps due rather to the septic state of the mouth with the frequently coexistent pyorrhoea and tartar, than to commencing secondary epitheliomatous involvement (which, however, surely follows), the first gland notable to palpation being generally situated under the edge of the jaw, beneath the first molar tooth. At a later stage gland involvement below the mastoid process appears and this sign has come to mean to me the absolute bar to any attempt at removal, appearing particularly to go with deep involvement of the pterygoid region, rendering even an apparently clear margin out of the question.

Recurrence generally occurs far back or else along the line of healing on the buccal surface. In cases where, the jaw having been affected, the cheek growth, half-jaw and glands beneath have all been removed *en masse*, further glandular involvement is not usual, but in one or two cases where the extremely local character of the cheek growth and the absence of any palpable glands have led me to leave the neck alone, I have seen very rapid involvement of the neck glands, far surpassing in rapidity and amount the usual course with a primary growth *in situ*, as if, perhaps, the combined influence of the cancer cells absorbed before or liberated at the time of operation and the absorption of inflammatory products from the healing mouth wound produced a far greater effect than either would have done separately.

In cases where the primary growth seems local and removable I have come to favour strongly the method that I see Mr. H. J. Paterson suggested in general at the Section of Surgery at the Annual Meeting, and has practised in particular on a series of cases of cancer of the tongue—namely, to remove the primary growth first and the glands some weeks later, after they have had time to "intercept any cancer cells left behind in the wound, acting indeed as Nature's wound scavengers" (September 29th, p. 557).

I do not think that Dr. John Campbell's theory of infection "by a hand contaminated by soil" is at all borne out by the probabilities of the class of cases we are considering, in which event cases should be far more numerous both in gross and in proportion amongst those who labour on the land; I should say that, if anything, more cases, both numerically and certainly proportionally, would be found among the non-agriculturists, who, having more leisure and money, in many cases chew the more. Cases, for instance, are quite common amongst the Brahmins, who neither sow nor reap in the agricultural sense.

In conclusion I may say that while cases of this form of cancer are common amongst chewers of betel, there is in Travancore, and I suppose in Ceylon, a minority of people who do not chew: I have never seen a case of the kind in a non-chewer.—I am, etc.,

London, N.19, Oct. 15th. PERCY E. TURNER, M.D., B.S.

THE TREATMENT OF TUBERCULOSIS BY THE SPAHLINGER METHOD.

SIR,—I am greatly indebted to Dr. Watts (October 13th, p. 680) for supplying additional facts concerning M. Spahlinger and his method of treatment; but the point is, why has not M. Spahlinger placed his discoveries before the medical and scientific world?

Dr. Watts states that there is no secrecy about the preparation of the serums and vaccines, yet this statement is at variance with the report of the Chief Medical Officer to the Ministry of Health. This report affirms that the technique adopted in the preparation of the serums and vaccines remains undisclosed, and goes on to say that an offer was unofficially made to M. Spahlinger for a medical committee to investigate his method of treatment, but he was unable to accept this offer in spite of the fact that he would not be required to divulge his technique of preparation.

Why did not M. Spahlinger accept this offer, especially as he had 400 cases already treated?

I do not think the medical profession is prejudiced against him just because he is not a medical man. It is because he fails to disclose his technique, and if his treatment is all that he claims for it then it is his duty to suffering humanity to place that technique before the profession. Moreover, if his financial situation is such that he cannot proceed with the preparation of his serums and vaccines why has he refused offers of several hundred thousand pounds, just to reserve to himself the exclusive rights of this method of treatment?

I think the Ministry of Health acted very fairly towards M. Spahlinger, and it does not redound to his credit that he did not avail himself of the opportunity then placed before him of demonstrating the efficacy of his method of treatment, or on the other hand of supplying the information necessary for the proper preparation of the vaccine by bacteriologists more favourably situated than himself. Could he not be induced to publish his technique? It would not detract one iota from his reputation, for in all probability his name would always be associated with this method of treatment, and should the results be successful so much the more would he be esteemed.—I am, etc.,

GEORGE W. CHEATER, M.B., D.P.H.

Whipps Cross, E.17, Oct. 15th.

PELLAGRA.

Sir,—I was very interested in reading Drs. Hutchison and Paterson's paper in your issue of October 13th, as in August last I saw a boy, aged about 12, suffering from this disease. He was the son of a vagrant harvester, and had never been outside England.—I am, etc.,

Sutton Scotney, Oct. 16th. Chas. Farrant.

Obituary.

SIR WILLIAM RICE EDWARDS, K.C.B., K.C.I.E.,

Late Director-General, Indian Medical Service.

We greatly regret to announce the death of Major-General Sir William Edwards, K.C.B., K.C.I.E., who vacated the office of director-general, Indian Medical Service, last January. His death, which occurred in London on October 13th, was due to pneumonia.

William Rice Edwards, who was born on May 17th, 1862, was the son of the late Canon Howell Powell Edwards, of Caerleon, Monmouthshire. He was educated at Magdalen College School, Oxford, at Clifton College, and at the London Hospital. He took the diploma of M.R.C.S. in 1884 and graduated M.B.Durh., with honours, in the same year. After acting as house-physician and house-surgeon at the London Hospital, he entered the Indian Medical Service as surgeon on April 1st, 1886. Having spent his first two years on military duty, he took civil employment in Bengal, where he acted as civil surgeon of Nadiya, till in 1890 he was appointed personal surgeon to the Commander-in-Chief, Lord Roberts. That post he held for four years. When Lord Roberts left India Edwards joined the political department. When Lord Roberts went out to take the command in South Africa, at the end of 1899, Edwards was again appointed to his personal staff, and served through the South African war in 1899-1900, taking part in operations in Cape Colony, the Orange River Colony, and the Transvaal, including actions at Johannesburg, Diamond Hill, and Belfast, was mentioned in dispatches, in the *London Gazette* of April 2nd, 1901, and received the Queen's Medal with five clasps, and the C.M.G. On his return to India he was appointed residency surgeon in Kashmir; nine years later he became chief medical officer of the North-West Frontier Province. He was promoted to the administrative grade as colonel on May 25th, 1914, and on April 1st, 1915, became surgeon-general of Bengal, his title of rank being altered to major-general, like all other surgeons-general, in 1918. On January 8th, 1918, he was appointed director-general of the Indian Medical Service, and after holding that post for the usual five years came home on leave, retiring so recently as July 8th last.

He received the C.M.G., for the South African war, on November 29th, 1900, the C.B. on June 22nd, 1914, a Good Service Pension on April 1st, 1915, on February 18th, 1917, he was appointed honorary physician to the King; in 1919 he received the honorary fellowship of the Edinburgh College of Surgeons, was gazetted K.C.I.E. on June 4th, 1921, and K.C.B. when he left India on January 1st last. While director-general he was also a member of the Council of State for India. He married twice—first, in 1896, the daughter of the late W. H. Darley, of Leap Castle, King's County, who died in 1911; and secondly, in 1919, the widow of the late Lieut.-Colonel Robert Bird, C.I.E., I.M.S. A memorial service was held at the Savoy Chapel on October 17th.

As director-general Sir William Edwards had a trying task; his predecessor, Sir Pardey Lukis, was a man of exceptional parts, and would in any circumstances have been very hard to follow. But Edwards had to face difficulties of a kind Lukis never knew. Within a few months of his appointment as director-general the famous report on Indian constitutional reforms by Mr. Montagu, then Secretary of State for India, and Lord Chelmsford, then Governor-General, was published. The object in view was to transfer in large measure government and administration in India into the hands of Indians, by establishing a Council of State and a Legislative Assembly for all India, provincial legislatures in all provinces, and eventually vesting complete popular control in local bodies. Among the subjects to be transferred at the earliest possible date were medicine and public health, and it was, of course, at once obvious that the position of the Indian Medical Service and the prospects of its officers would be very seriously affected. Edwards, of course, loyally accepted the decision of the British and Indian Governments and devoted his best energies to making the transition work smoothly while safeguarding the interests of the officers of his own Service. He was able to state at the dinner of the Indian Medical Service in London last June that the Secretary of State in Council had made regulations reserving for officers of the Indian Medical Service a total of 305 civil posts, thus providing civil employment for 388 I.M.S. officers, including leave and study reserve. Of these posts, 65 were to be under the Government of India and 240 under local governments. Of the latter the posts of surgeon-general, inspector-general of civil hospitals, and director of first-class provincial bacteriological and Pasteur institutes were to be filled by the nomination of the Government of India. These regulations, though they imply a serious curtailment of the opportunities open to I.M.S. officers in the future, imply also that the Government intends to maintain the service, though with a smaller cadre. They are, however, provisional and are to be without prejudice to the final orders to be passed by the Secretary of State in Council when he has received and considered the report of the Royal Commission which is about to go to India under the chairmanship of Lord Lee of Fareham, to inquire into the public services, including officers of the Indian Medical Service in civil employment. Sir William Edwards protested at this dinner that the regulations did not go far enough in reserving appointments, and that those of professors, of alienists, as clinical examiners, and to jails and to public health offices should be made by the Government of India from an all-India service. We imagine that Edwards was in certain other respects disappointed by the Secretary of State's decision, but he had the satisfaction of knowing that during his term of office as director-general he had not failed again and again courageously to represent to the Government of India the views he strongly held as to what was best for the cause of science and of medical education and India, and for the teeming millions of the peninsula who know and care little for forms of government.

Edwards, a tall, spare man, possessed great personal charm; he had many friends throughout all the services in India and had he been spared would have continued to serve that country as a representative of the Government of India on the Permanent Committee of the International Bureau of Public Health.

M. T. SADLER, M.D.,

Late of Barnsley.

The death is announced of Dr. Michael Thomas Sadler, who practised in Barnsley and its neighbourhood for forty-four years. He was born in 1834, and after receiving his preliminary education at Wesley College, Sheffield, became a student of St. Bartholomew's Hospital, and studied also in the University of Edinburgh. He graduated B.A.Lond. in 1853, took the M.B. degree (with honours) in 1857, and the M.D. in 1861. He was consulting physician to the Beckett Hospital, Barnsley, and medical officer of health for the borough and the surrounding district.

Dr. Sadler was a man of wide culture and public spirit; assiduous, within the limits of his leisure, in foreign travel; and a careful student of French and Italian literature. At one time he knew by heart *Paradise Lost*, the first part of *Faust*, and Dante's *Inferno*, and used to repeat long passages to himself during his country drives. After his retirement, he gave much of his leisure to the work of the Charity Organization Society. His father, who bore the same name and was also a doctor in Barnsley, was author of *The Bible: The People's Charter*, and his great-uncle was Michael Thomas Sadler of Leeds, M.P. for Newark, social reformer and political economist. Partly of Huguenot descent, Dr. Sadler traced his lineage from Sir Ralph Sadleir (1507-87) and another of his forebears,

who lived in Dovedale, was a fishing friend of Izaak Walton. He leaves five children. His eldest son is Sir Michael Sadler, Master of University College, Oxford, and his second, Dr. F. J. Sadler of Barnsley.

The death is announced at Marley, Garmouth, Morayshire, of Dr. WILLIAM GEDDIE, who was for forty-four years a well known medical practitioner at Accrington, Lancashire. He received his medical education at the University of Aberdeen, and graduated M.B., C.M. in 1874 and M.D. in 1886. After a brief period in Rossendale he went to Accrington, where he speedily established an extensive general practice. Devoted to his profession, Dr. Geddie was recognized as a most able practitioner, and the greatest confidence was reposed in him. He held many public appointments, and for more than twenty-five years was police surgeon for the borough. He was a member of the honorary medical staff of the Victoria Hospital, Accrington, from its foundation in 1896, and on his retirement from the active staff he was appointed consulting surgeon. During the war he acted as medical officer to Baxenden Red Cross Hospital. He was an old member of the British Medical Association. Dr. Geddie was twice married, and is survived by his widow and by four sons, two of whom are members of the medical profession.

Dr. JOHN LYELL SMIRTHWAITE-BLACK, who died at Burnley on September 20th, was a native of Fife, and received his medical education at the University of Edinburgh, where he graduated M.B., C.M. in 1881. His father, the late Dr. Black, was a medical practitioner in Burnley, who died in 1886, and the name of Smirthwaite was assumed by Dr. Smirthwaite-Black when he married the widow of the late Dr. Smirthwaite in 1889. He was a member of the Burnley Borough Council for over fourteen years from 1889, but otherwise took little part in public life. He had a cultivated taste in literature, and was devoted to his hobby of rose-growing. He is survived by his widow.

Dr. HAROLD MOWAT, radiologist to the Government of the Federated Malay States, died at Kuala Lumpur, the capital of those States, on August 21st, aged 40. He was educated at Manchester and Edinburgh Universities, and graduated in the latter as M.B. and Ch.B. in 1905, and as M.D. in 1907. After acting as house-surgeon of the Royal Surrey County Hospital at Guildford he took up radiology as a specialty, and had filled the posts of clinical assistant in the *x*-ray and electricity departments at Charing Cross Hospital, medical officer in charge of the same departments at the Metropolitan Hospital, and radiologist of the Royal Chest Hospital in City Road, London, and of the Hampstead and North-West London Hospital. He took a temporary commission in the R.A.M.C. on November 2nd, 1914, and served as radiologist in No. 17 General Hospital and in No. 12 Indian General Hospital, and also served for some time as surgeon in the Royal Navy. He had only recently taken up his late post.

The Services.

TERRITORIAL DECORATIONS.

THE Territorial Decoration has been conferred upon the following officers of the R.A.M.C. (T.A.) under the terms of the Royal Warrant dated October 13th, 1920: Colonel P. B. Giles, C.B., F.R.C.S., V.D. (ret.); Lieut.-Colonel F. Darlow, Major H. Henry, *M.C.*, and Major J. E. N. Ryan.

DEATHS IN THE SERVICES.

Surgeon Colonel William Thomas Martin, Army Medical Staff (ret.), died at Bournemouth on September 15th, aged 81. He was educated at Queen's College, Galway, where he graduated B.A., gaining the gold medal, in 1859, and M.D. in 1862, both being degrees of the late Queen's University; he took also the L.R.C.S.I. in the latter year. In 1882 he graduated M.A. of the Royal University of Ireland, which had taken the place of the Queen's, and in 1920 received the degrees of M.A. and M.D., *ad eundem*, from Belfast University. He entered the army as assistant surgeon in 1863, and served under the old regimental system in the 45th Foot, now the Notts and Derby Regiment, or Sherwood Foresters. He attained the rank of surgeon colonel on June 6th, 1893, and retired on September 2nd, 1896. He served in the Abyssinian war of 1867–68, when he was present at the capture of Magdala, was mentioned in dispatches in the *London Gazette* of June 30th, 1868, and received the medal; and in the Burmese war from 1885 to 1887, receiving the Indian Frontier medal with a clasp. In 1876–77 he was surgeon to the Governor of Madras, and afterwards, in 1880–82, was on the staff of the Royal Victoria Hospital and Army Medical School, Netley.

Universities and Colleges.

UNIVERSITY OF OXFORD.

Degree Days.—The remaining degree days in the present term are: Thursday, November 1st, Saturday, November 17th, Thursday, November 29th, and Saturday, December 15th.

UNIVERSITY OF CAMBRIDGE.

AT a congregation held on October 13th the following medical degrees were conferred:

M.D.—W. F. R. Castle, H. A. Williams.
M.B., B.CH.—W. G. Woolrich.
M.B.—A. B. Bratton, E. C. Curwen.
B.CH.—F. E. Higgins, S. Orchard.

UNIVERSITY OF GLASGOW.

The following degrees were conferred on October 15th:

M.D.—*J. N. Cruickshank, *D. M'Alpine (*in absentiâ*), †J. M'C. Lang, †Alexandrena M. Maclennan, †C. L. Sutherland, †W. Telfer, K. Falconer, A. Fraser, H. J. Macbride.

M.B., CH.B.—*B. G. Ives, *D. L. Pow, *A. S. Henderson, †A. Meiklejohn, †Janet M'L. Stewart, †A. M. Girvan, †M. Cohen, †J. M. Henderson, †J. M'K. Fleming, †P. Shannon, †Monica M. Bateman, †J. Gibb, †T. W. Hill, †A. M'Lellan, J. H. Adam, J. R. B. Alexander, S. M. Allan, C. P. Allan, Isabella D. Anderson, M. C. Bain, Margaret A. Barr, O. F. Barr, H. Baxter, J. B. Bell, J. S. Bizzett, J. D. Black, R. Black, C. C. Blair, H. W. Bowyer, Marion C. Boyd, W. Brown (Ardrossan), W. Brown (Glasgow), W. M. Brown, A. Browning, T. W. Buchan, I. M. Burdon, A. B. Burns, J. B. Bushe, Isabella E. Campbell, P. A. Carrie, Evelyn L. Caskey, D. L. Charters, Isobel M. Chisholm, G. Cochrane, S. R. Costley, W. Craig, G. M. Currie, Lucie Leon van Dam, A. F. Davidson, Elsie B. Dickinson, J. L. Dunlop, A. N. Fergus, J. Fleming, Anne M. Forrest, J. C. Fotheringham, A. L. Galbraith, E. J. M. Gallagher, J. E. Geddes, E. G. Gerstenberg, J. M. S. Gilbert, J. D. Glaister, A. D. Gowans, Mary J. L. Gracie, G. F. Graham, J. W. Graham, Christina Grant, R. Haddock, A. Hamilton, J. Hamilton, W. H. Hay, D. Henderson, J. Henderson, N. P. Henderson, E. Holmes, W. A. Horne, Jennie C. Hunter, T. M. Hunter, Sara Jacobs, R. J. Jarvie, D. P. K. Jockel, M. Joels, J. M'Q. Johnston, J. S. Kamester, W. Kelm, J. A. Kerr, M. Laidlaw, J. Laurie, Agnes A. Lawson, J. C. Lindsay, Flora Livingstone (Mrs. R. N. MacDonald), A. Logan, M.A., A. Logan, Daisy B. M'Bride, Alexandra M. MacCormick, Agnes M'Creadie, H. M'Crorie, A. W. M'Culloch, Eileen M. M. Macdonald, Isobel C. Macdonald, S. R. M'Dougall, A. M'Glashan, Cecilia M'Guiness, D. G. S. Mackay, Mary L. M'Kay, T. S. M'Kean, Euphemia D. Mackenzie, J. C. H. M'Kenzie, P. L. M'Kinlay, W. W. Mackinlay, J. M'Laren, Margaret B. M'Lellan, A. M. Macleod, Catherine M. Macleod, M. Macleod, N. MacLeod, N. C. Macleod, Grace M'Lintock, Margaret J. M'Pherson, May Marshall, Margaret M. U. Martin, R. D. Martin, E. E. Miller, D. M. Mitchell, J. J. Mitchell, Marjorie H. Mitchell, G. Montgomery, A. Morrick, Leah Morris, J. G. Munro, M. Murchison, T. J. Murray, R. Naftalin, Gertrude M. Neale, T. C. H. Neil, J. Ordansky, M. Orr, G. A. Pollock, T. G. Rankine, L. Reid, Margaret G. Reid, Annabella Rennie, J. Rennie, S. Revels, Kathleen M. Riddle, H. Rinn, D. Robertson, W. M. Robertson, Florence M. Robinson, Alice Rosenblatt, A. W. Ross, A. Russell, Georgina Russell, J. M. Sclater, A. C. Scott, S. C. Scouller, N. S. Setten, W. C. Sharp, H. J. Sheppard, A. Sheridan, J. S. I. Skottowe, C. C. I. Slorach, R. McD. Smellie, Elizabeth C. Smith, M.A., Mary S. Smith, Olive M. Somerville, S. M. Steel, Enid G. Stevenson, L. Stevenson, Mary Y. M'A. Stevenson, W. L. Stewart, Margaret E. Stobo, A. J. Struthers, G. Struthers, Nora Surtees, A. Sutherland, W. D. Sutherland, W. S. Syme, Annie V. Taylor, W. M. P. Taylor, T. Tennent, D. F. S. Thomson, J. Masterton Thomson, J. Meason Thomson, M. L. M. Thomson, Ann W. Turnbull, A. R. Waddell, J. Walker, R. Walker, H. C. Wallace, J. A. Waterman, J. N. Watson, W. H. Watson, W. T. Westwood, J. Wilkie, Anne C. Wilson, H. E. C. Wilson, W. B. Wilson, J. Wingate, Margaret E. Wylie, J. S. Young, Jean L. Young.

John Stirling Young, M.A., B.Sc., M.B., Ch.B., who graduated on April 21st, 1923, gains the Brunton Memorial Prize of £10, awarded to the most distinguished graduate in medicine of the year.

* With honours. † With commendation.

UNIVERSITY OF ST. ANDREWS.

DURING the ceremonies connected with the installation of Mr Rudyard Kipling as Lord Rector of St. Andrews University last week the honorary degree of LL.D. was conferred upon Sir John Bland-Sutton, President of the Royal College of Surgeons of England, and consulting surgeon to the Middlesex Hospital.

At the graduation ceremony held on October 5th the Vice Chancellor, Principal Irvine, inducted Professor Adam Patrick to the Chair of Medicine, and Professor John Read to the Chair of Chemistry. The following medical degrees were conferred:

M.B., CH.B.—M. K. Afridi, C. R. Baxter, T. F. Black, N. T. Brown, W. F. Dorward, E. Douglas, A. A. Finnigan, J. R. Graham, L. A. M. Johnston, J. A. G. Keddie, G. D. Laing, J. P. Laird, V. R. Lindsay, F. M'Lagan, J. R. Murray, N. Nelson, P. C. Robertson, J. D. Saggar, J. O. Stephen, G. J. Sturrock.

Medical News.

THE annual dinner of the past and present students of the Manchester School will be held at the Grand Hotel, Aytoun Street, on Thursday, November 8th, at 7.30 p.m. Tickets, price 15s. 6d., may be obtained from the honorary secretary, Dinner Committee, Medical School.

THE annual dinner of the London branch of the Association of Alumni of the University of Bristol will take place at Pagani's Restaurant on Friday, November 9th, at 7.30 p.m. The price of the dinner is 8s. 6d., exclusive of wine. Further particulars can be obtained from Dr. E. Casson, Holloway Sanatorium, Virginia Water, Surrey.

THE first of the Chadwick public lectures for this session will be given at the house of the Medical Society of London (11, Chandos Street, Cavendish Square, W.) on Monday, October 29th, at 5.15 p.m., by Dr. C. Killick Millard, who will speak on the disposal of the dead. A course of three lectures at 8 p.m. on Fridays in November, beginning on November 9th, will be given by Major Harry Barnes, V.P.R.I.B.A., on hygiene and architecture. In December Dr. A. K. Chalmers (M.O.H. Glasgow) will give two lectures in London on housing standards, the first at the Goldsmiths' College Lecture Hall, New Cross, on Monday, December 3rd, at 8 p.m., and the second on Wednesday, December 5th, at 5.30 p.m. at the Kensington Town Hall.

THE Cremation Society of England has arranged a conference of cremation authorities to be held by invitation of the Lord Mayor of Liverpool at the Town Hall, Liverpool, at 3 o'clock, on Thursday, October 25th. The chair will be occupied by Mr. H. T. Herring, O.B.E., M.B. Among the subjects for discussion are cremation propaganda; the question of forming a federation of cremation authorities; and the issue of certificates during lifetime for subsequent cremation at death.

THE Chelsea Hospital for Women has received from its senior surgeon, Mr. Arthur E. Giles, a donation of £100 towards the fund required for building its nurses' home. When completed, forty-five more beds will be available for patients.

AT a special penal meeting of the Central Midwives Board for England and Wales held on October 11th, with Sir Francis Champneys in the chair, two midwives against whom charges were heard were struck off the roll. The business dealt with by the Standing Committee included approval as lecturers of Drs. Elizabeth L. Ashby, Howard English, and Robert Park. Approval as teacher was granted to one midwife, and subject to conditions to four others. The next meeting of the Board is to be held on November 15th.

FOR attempting to obtain 30s. from a Liverpool medical practitioner by false pretences, Charles Ferguson, alias Merilees, aged 75, of no fixed abode, was sentenced by the Liverpool stipendiary, on October 5th, to three months' imprisonment in the second division. Dr. W. M. Scott of Liverpool said that the prisoner came to him in the first instance with the story that he was a medical man who was in straitened circumstances, and he had given him money to the amount of £3. On September 21st the prisoner said he could obtain for witness a F.R.C.S. diploma, for which the sum of 5 guineas would have to be paid. He added that 200 honorary diplomas were being distributed, and he had been offered one which he could dispose of to witness. The prisoner said that he wanted only 30s. that night to send away as registration fee. Dr. Scott informed the police, who thereupon arrested the man.

THE Paris, Lyons, and Mediterranean Railway Company announces that from November 4th next a through express will run daily between Calais and Vintimille in connexion with the 11 o'clock service from London (Victoria). The Office Français du Tourisme (56, Haymarket, London, S.W.1) is prepared to advise intending visitors to the Riviera as to trains and generally on the choice of a resort.

THE Institute of Physics, acting in co-operation with the National Physical Laboratory, has established a *Journal of Scientific Instruments*. Its purpose is to describe methods of measurement and the construction and use of instruments used in all branches of scientific and technical work. It will be published on the 15th of each month. The annual subscription, which may be sent to the Institute of Physics, 10, Essex Street, London, W.C.2, is 30s. The scope of the new periodical may be judged by some of the contents of the October number, the first to appear. Among the papers it contains is one on the measurement of true height by aneroid; another is on two new methods of measuring the internal diameters of transparent tubes; and in a third Mr. C. V. Boys, F.R.S., describes a general purpose recording drum.

PASSAGES in the annual report of the Ministry of Health for 1922–23, dealing with the Food and Drugs Act, have been published, together with abstracts of reports of public analysts for 1922, in a pamphlet (H.M. Stationery Office) which can be obtained through any bookseller, price 1s. 6d.

THE October number of *The World's Children*, a quarterly journal of child care and protection "considered from an international viewpoint," contains articles by the Right Hon. Edward Wood, M.P., President of the Board of Education, Sir Robert Baden-Powell, Major Leonard Darwin, and others. The price of the journal is 1s. net, and it is published at 30, Mortimer Street, W.1.

THE annual report of the National Council for the Unmarried Mother and her Child shows that this organization has had a year of useful and successful work. The Bastardy Bill, which it promoted, passed through both Houses of Parliament, and considerable progress was made with its Legitimacy Bill. The number of individual cases considered was 610; the policy of the Council is not to give doles in these cases but to assist the unmarried mother in meeting her difficulties and in supporting herself and her child. The address of the Council is Carnegie House, 117, Piccadilly, London, W.1.

DR. C. A. T. RUMPEL, director of the Barmbeck Hospital, Hamburg, who gave his name to the Rumpel-Leede sign in scarlet fever, died recently at the age of 62.

Letters, Notes, and Answers.

IN order to avoid delay, it is particularly requested that *ALL* letters on the editorial business of the JOURNAL be addressed to the Editor at the Office of the JOURNAL.

ORIGINAL ARTICLES and LETTERS *forwarded for publication are understood to be offered to the* BRITISH MEDICAL JOURNAL *alone unless the contrary be stated.*

CORRESPONDENTS who wish notice to be taken of their communications should authenticate them with their names—of course not necessarily for publication.

As, owing to printing difficulties, the JOURNAL *must be sent to press earlier than hitherto, it is essential that communications intended for the current issue should be received by the first post on Tuesday, and lengthy documents on Monday.*

AUTHORS desiring reprints of their articles published in the BRITISH MEDICAL JOURNAL are requested to communicate with the Office, 429, Strand, W.C.2, on receipt of proof.

THE postal address of the BRITISH MEDICAL ASSOCIATION and BRITISH MEDICAL JOURNAL is 429, Strand, London, W.C.2. The telegraphic addresses are:

1. EDITOR of the BRITISH MEDICAL JOURNAL, *Aitiology Westrand, London*; telephone, 2630, Gerrard.
2. FINANCIAL SECRETARY AND BUSINESS MANAGER (Advertisements, etc.), *Articulate Westrand, London;* telephone, 2630, Gerrard.
3. MEDICAL SECRETARY, *Mediscera Westrand, London;* telephone, 2630, Gerrard. The address of the Irish Office of the British Medical Association is 16, South Frederick Street, Dublin (telegrams: *Bacillus, Dublin*; telephone, 4737, Dublin), and of the Scottish Office, 6, Rutland Square, Edinburgh (telegrams: *Associate, Edinburgh*; telephone, 4361, Central).

QUERIES AND ANSWERS.

"E. H. W." would be grateful for any information with regard to the treatment of cataract by the use of colour therapy.

"E." asks how a patient with a colotomy wound can give himself an enema and attend to himself subsequently without help. He finds that the enema ensures comfort and freedom from discharge for twenty-four hours, but that the help of a nurse is required every morning. He is thus prevented from going from home.

ASTHMA IN CHILDHOOD.

"J. G. B." asks for advice in the treatment of a girl, aged 5, with some evidence of an asthmatic family history, who suffers every five or six days from an acute dyspnoeic attack with rapid, shallow breathing, sucking in of the chest wall, and signs in the chest which to the ordinary observer appear like acute bronchitis. The onset of these attacks is rapid, and the symptoms and signs clear up as quickly as they come on.

*** The recurrent attacks of what appears to be asthma in a child with an asthmatic family history strongly suggest hypersensitiveness to some foreign protein, such as cat, dog, horse dandruff, or some article of food. Systematic testing by skin reactions would be the best way of determining the agent responsible for the attacks and so its elimination. Reference might be made for guidance in this respect to recent works on asthma, or to the discussion on this subject in the BRITISH MEDICAL JOURNAL, 1921, ii, 235 et seq. Short of this, careful scrutiny of the surroundings and experimental elimination of possible asthma-exciting articles of diet might throw light on the causation.

INCOME TAX.

A Groom-Gardener.

"H. M. C.'s" groom does odd jobs about the place and works on a ten acre holding, in addition to doing work in connexion with the practice. The inspector of taxes wants to know what proportion of his wages is paid for the latter.

*** The inspector is within his rights in claiming to restrict the deduction made for purposes of the Schedule D return to the proper proportion. In the absence of any definite criterion, the proportion might be reckoned by reference to the time spent by the groom on work for the practice, as compared with his other work. Something might reasonably be added to that estimate on the ground that his work as groom was his primary job, and that the other work was done to fill up his time.

Hospital Residents.

"L. D." holds a resident hospital appointment, which was advertised as of the value of £125 per annum *plus* board, rooms, attendance, and laundry. In fact he receives the salary *plus* an allowance of £6 10s. a month for board and 3s. a week for laundry, and is charged by the hospital with an account for board and lodging. Is he liable to assessment in respect of anything beyond the £125 per annum?

*** The leading case on the subject is Tennant *v.* Smith, in which the House of Lords laid down the rule that income tax does not extend to anything which is not received in money or in a form capable of being turned into money. This rule draws a clear but not very equitable distinction between, for instance, a salary to an outdoor employee, which is entirely assessable to tax, and a smaller sum paid in regard of the fact that the recipient has certain advantages (not capable of being turned into money) such as free board or residence. "L. D.'s" position is somewhat peculiar and it is not easy to say into which category his allowances fall. There appears to be no judicial decision covering the point, which is whether the crediting of his account with the allowances, coupled with the condition that that account is liable to the charge for board, etc., amounts to a payment in money. There are two weaknesses in his contention—first, that he is entitled to draw out at least the unexpended portion for private purposes, and secondly, that equity is against him: the real worth of his emoluments is represented by the total, and the ordinary salaried employee pays on that basis.

The Car of a Retiring Practitioner.

"J. F." has recently given up practice and expects to lose, say, £250 when he disposes of the car which he formerly used for professional purposes.

*** "J. F." cannot claim any allowance in respect of the loss; the only sum that can be allowed is the expense of replacement, and the car is not being replaced; further, as "J. F." is not now in practice, he is not paying tax on professional income and there is no assessment from which a deduction could be made. This case illustrates the unfairness of refusing professional earners permission to deal with the expense of maintaining their cars by a deduction for annual depreciation; where replacement cost is the basis of the allowance there must always be an ultimate loss to the taxpayer. The Royal Commission on the Income Tax recommended that a change should be made, but it is a long time in coming.

LETTERS, NOTES, ETC.

HOMES FOR MENTAL CASES.

DR. A. C. GEMMELL (Brighton) writes: In the BRITISH MEDICAL JOURNAL, August 4th (p. 214), you deal with the question of certifiable but uncertified lunatics in nursing homes. I am clear that a lunatic cannot legally be kept for profit in a nursing home except under certificate; I am also clear that such a patient can legally be kept without certificate in the house of his parents, where there is no question of payment; but I am in doubt about the intermediate cases. For instance, can a lunatic not under certificate be received into furnished rooms, the son of the lunatic paying for the lunatic's board and lodging and also for the services of a nurse provided by himself? If this is legally possible, what is the distinction in principle between the boarding house and the nursing home? If this is illegal, it places a heavy burden on the boarding-house keeper of deciding whether the lodger be certifiable or not.

*** The question of a lunatic treated in the circumstances mentioned in this query is covered by Section 315 (1) of the Lunacy Act, 1890. It reads as follows:

> "Every person who, except under the provisions of this Act, receives or detains a lunatic, or alleged lunatic, in an institution for lunatics, or for payments takes charge of, receives to board or lodge, or detains a lunatic or alleged lunatic in an unlicensed house, shall be guilty of a misdemeanour, and in the latter case shall also be liable to a penalty not exceeding fifty pounds."

This section makes it clear that it would be illegal for a lunatic not under certificate to be received into furnished rooms, the relatives paying for the lunatic's board and lodging, and also for the services of a nurse. There is no distinction in principle between the boarding house and the nursing home. "Receiving to board or lodge" in the above section must be read as distinct from "taking charge." The opinion has been given by the law officers that if a lunatic is received to board or lodge in the house of one person, and another takes charge of him, both are subject to penalty. It is thus the person who takes charge of, who receives or detains, a lunatic contrary to the provisions of the Lunacy Act, who is liable to prosecution, rather than the practitioner who visits the patient. It is certainly difficult for a boarding-house keeper to decide as to the certifiability of a lodger, but in the event of a prosecution the court would no doubt need to be convinced that she could reasonably have been expected to know that the patient was insane. As it is quite possible that neither the relations, nurse, nor landlady would be aware of any breach of the law, a good deal of responsibility would seem to devolve upon the practitioner in attendance to advise as to the legality of the position.

DANGEROUS EXHAUST GASES.

THE engineering department of the Automobile Association points out that as the winter is coming on many owner-drivers will be carrying out carburettor and ignition adjustments in their motor houses with closed doors. A word of warning, therefore, is directed against the danger of running an engine stationary for any length of time within closed premises. To form the gas required, petrol is mixed with approximately seventeen or eighteen times its weight of air, and, provided combustion is complete, the mixture is burnt to carbonic acid gas and water vapour. These ideal conditions, however, seldom obtain, with the result that the exhaust gases contain a certain amount of carbon monoxide. It frequently happens that a super-rich mixture is employed at closed throttle positions for purposes of easy starting or to obtain good "idling" of the engine. When running stationary, therefore, in the garage, carbon monoxide is likely to be present in the exhaust gases, and it is desirable to have proper ventilation either by keeping the doors open or by fixing an extension on to the end of the exhaust pipe carrying it through an aperture in the door or building.

THE LONDON SCHOOL OF DERMATOLOGY.

IN the paragraph describing the institution of a London School of Dermatology, published last week (p. 673), the name of Dr. James H. Stowers was inadvertently printed as Dr. J. H. Stiles. The error was unfortunate, because we understand that Dr. Stowers has been largely instrumental in carrying through the negotiations which led up to the present satisfactory position. In recognition of his services he was entertained to a complimentary dinner by his colleagues at the Trocadero last week, with Sir Malcolm Morris in the chair.

MEDICAL GOLF.

THE autumn meeting of the Medical Golfing Society was held at Rye Golf Club on October 13th and 14th. The society wishes particularly to record its appreciation of the hospitality and great kindness shown it by the officials and members of Rye. Two fine scratch scores were recorded by Mr. Gillies (74) and Mr. Kolesar (76). The results of the competitions were as follows:

Canny-Ryall Challenge Cup.—H. P. Aubrey: 85 − 10 = 75. H. D. Gillies: 74 + 3 = 77. H. Wolseley Lewis: 85 − 7 = 78. T. P. Kolesar: 76 + 3 = 79.

Scratch v. Bogey (under Handicap).—Sir K. Goadby: 2 down. H. Wolseley Lewis: 4 down.

Foursomes v. Bogey (under Handicap).—H. A. Richards and W. Gilliatt; W. L. Lamplaugh and H. D. Gillies.

The seventh bi-annual meeting of the Shropshire Medical Golf Association was held on the Wrekin course by the kind permission of the committee. The results were as follows:

Medical Challenge Bowl.—Mr. S. Bradford: 86−13=73. Dr. G. Lawrence: 84−8=76. Dr. W. H. Smith: 96−20=76. Twenty-six entries.

Foursomes v. Bogey.—Drs. J. Wheatley and T. R. Elliott, 4 down; Dr. Clarke and Mr. Edmond, 5 down.

Dr. G. Wedd of Wellington was unanimously elected captain and Dr. Elliott honorary secretary for the ensuing year. A very hearty vote of thanks was proposed to Dr. J. Wheatley, the retiring captain, which was received with acclamation. The next meeting was fixed for the end of May, 1924, on the Church Stretton links.

VACANCIES.

NOTIFICATIONS of offices vacant in universities, medical colleges, and of vacant resident and other appointments at hospitals will be found at pages 38, 39, 42, and 43 of our advertisement columns, and advertisements as to partnerships, assistantships, and locumtenencies at pages 40 and 41.

A short summary of vacant posts notified in the advertisement columns appears in the *Supplement* at page *187*.